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North Fork Well
Final Environmental Impact Statement

Bureau of Land Management, Worland District, Wyoming
United States Forest Service, Shoshone National Forest, Wyoming

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1985

NORTH FORK WELL
FINAL ENVIRONMENTAL IMPACT STATEMENT

Lead Agency: Bureau of Land Management, U. S. Department of the Interior

Cooperating Agency: Forest Service, U. S. Department of Agriculture

Type of Action: Administrative

Proposed Action: Approval of an application for Permit to Drill (APD) submitted by Marathon Oil Company. The APD is for an exploratory oil and gas well near Pagoda Creek in Park County, Wyoming.

Abstract: This EIS analyzes the environmental consequences of four alternatives, three of which involve drilling of an oil and gas exploratory well, and a "no action" alternative. Under Alternative I, personnel and equipment would be transported to the drill site near Pagoda Creek by helicopter and water would be moved through a temporary pipeline. Alternative II would involve trucking personnel, equipment, and water over a road to be constructed to the same site. A different drill site near Grace Creek would be used under Alternative III, and personnel and equipment would be transported by a combination of helicopter, horseback, or foot. Analysis of Alternative IV, the "no action" alternative, indicates that denying the APD would not result in any environmental impacts; although it could have detrimental economic impacts on the lease holders and operators. However, under the existing lease such an alternative would be authorized only if occupancy would detrimentally affect any endangered or threatened plant or animal species. Since the biological opinion prepared by the U. S. Fish and Wildlife Service concluded that the exploratory phase of the proposed North Fork Well APD is not likely to jeopardize the continued existence of any endangered or threatened plant or animal species; the "no action" alternative is beyond the BLM's authority to select.

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Worland, Wyoming 82401

Telephone (307) 347-9871

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Dear Reader:

Enclosed for your information is the Final North Fork Well Environmental Impact Statement (FEIS). In response to comments, we have supplemented and modified the analysis of environmental consequences and made factual corrections.

All comments on the draft and final EIS's will be considered in the decision-making process.

We extend our thanks to those individuals, organizations, agencies, and companies that provided suggestions and comments throughout the EIS process. Your help has been invaluable in the preparation of these documents which will assist us to more effectively manage the public lands.

Sincerely,

Chester E. Conard
District Manager

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FINAL
NORTH FORK WELL
ENVIRONMENTAL IMPACT STATEMENT

SHOSHONE NATIONAL FOREST
PARK COUNTY, WYOMING

Prepared By:

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WORLAND DISTRICT

Cooperating Agency:

U. S. DEPARTMENT OF AGRICULTURE
UNITED STATES FOREST SERVICE
SHOSHONE NATIONAL FOREST

WORLAND DISTRICT MANAGER

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SUMMARY

This Environmental Impact Statement (EIS) analyzes the impacts of drilling a proposed wildcat exploratory oil and gas well near Pagoda Creek in Park County, Wyoming, as proposed by Marathon Oil Company. The proposed site is in Section 34, Township 52 North, Range 106 West, (T52N, R106W). The EIS also analyzes alternatives to the proposed well. Each of these alternatives includes a different location or a different method of access. A "no action" alternative is also considered.

Oil and gas leases were issued in 1980 under the authority of the Mineral Leasing Act of 1920. The purpose of the proposed action is to test the underlying geologic structures and to possibly discover new oil and gas reserves. However, the proposed action does not include development of the reserves, if found, and any such development would have to undergo additional environmental review under the NEPA.

Before preparing this EIS, the BLM and the Forest Service received numerous letters expressing concern for wildlife, wilderness, tourism, scenic quality, vehicle access, water quality, housing for oil industry employees, local economic development, and the geothermal resources in Yellowstone National Park if the North Fork Well was drilled and an oil field was developed.

A public "scoping" process identified additional public concerns. These included impacts on commercial users, the local economy, the stability of the oil and gas industry, the Washakie Wilderness, access, public attitudes, property values, instream waterflows, mineral potential, and tourism.

Other issues and concerns that were identified before the EIS scoping process were effects on elk, bighorn sheep, grizzly bears, and threatened and endangered species; effects on stream quality, visual quality, and air quality; the possibility of increased traffic on the Yellowstone Highway; and effects on the character of the area. These concerns were carefully considered when impacts were analyzed.

A draft EIS was published in February 1984. Comments received during the comment period for that document prompted the BLM to prepare a second draft EIS which was released in October, 1984.

ALTERNATIVE I: DRILLING THE NORTH FORK WELL (PROPOSED ACTION)

In Alternative I, Marathon Oil Company proposes to drill a 5,000 feet exploratory oil and gas well in Section 34, T52N, R106W near Pagoda Creek. Support facilities would include a helicopter staging area along Clocktower Creek about one mile south of the Yellowstone Highway and a 2,550 feet long temporary water pipeline from Pagoda Creek to the well site. Other support facilities at the well site would include mud tanks, reserve pits, pipe racks, and covered soil stockpiles

Personnel, equipment, and supplies would be trucked to a helicopter staging area and shuttled to the proposed location by helicopters. Helicopters would fly up Clocktower Creek to the south then west toward the drill site to avoid flying over summer cabins on Pagoda Creek. The staging area would be placed off Highway 16 approximately 1 mile up Clocktower Creek, on an area previously used as a gravel pit. The helicopters would haul an estimated 910 loads and have an estimated flying time of 162 hours.

An area 75 feet by 80 feet will be graded nearly flat for the drill pad and reserve pit. The pit would be 10 feet deep. The topsoil would be bladed to one side and stockpiled in an area not to be disturbed. Construction materials would consist of soil encountered within the boundary area of the proposed site; that is, on-site materials would be used and no soil material would be flown in. The reserve pit would be constructed by bulldozing and blasting so that at least half the depth of the pit would be below the natural ground line. Impermeable plastic would be used to line the reserve pit and to protect the soil on the drill pad and in the stockpiles.

The drilling rig, pipe rack, generator, tool house, and drilling mud pump, pit, and supply platform would all be built on the drill pad. A blooie pit (see definitions) to contain cuttings and dust encountered in air drilling would be dug with a tracked vehicle and blasted with dynamite. The 60 feet by 20 feet pit would be 10 feet deep and disturb about 0.1 acre north of the drill pad.

Lease stipulations prohibit drilling in Section 34 before September 8; however it is recommended in this EIS that this stipulation be modified to permit drilling between June 20 and December 1. Activity, including construction drilling, and well completion, would be expected to continue for 2 to 4 months. All activity must be completed by January 1. Approval of this APD would not include approval of production facilities. A separate application for production facilities would be required if the well is a producer.

If potential for oil and gas is low, the well would be abandoned, and all the fresh water, oil, and gas zones must be plugged (isolated) to prevent contamination. The hole would then be cemented off and marked on the surface. The final step would be to reclaim the area until it resembled its original condition as nearly as possible. The reserve pit and any cuts would be filled, leveled, or sloped as needed. Top soil would be respread and the area would be revegetated with a mixture of Idaho fescue, and hard fescue. The staging area would be revegetated with such species as basin wild rye, bluebunch wheatgrass, fescues, and possibly some bromes, Lewis flax, and arrowleaf balsamroot.

Reclamation of disturbed areas at the well site and staging area would begin in the fall.

ALTERNATIVE II: ACCESS BY ROAD

Under Alternative II, the well would be drilled at the operator's proposed location, and in the same time and manner as Alternative I, but access would be by road instead of by helicopter. All aspects of drilling would be the same as for Alternative I, except for the following provisions.

An improved 4-mile road (crowned and ditched) would be constructed up the Pagoda Creek drainage to the well site. The road would take from 2 to 4 months to construct depending on the number of men and equipment employed.

Road construction materials, such as gravel, would be available from the old gravel pit along Clocktower Creek, which is the proposed staging area in Alternative I. An estimated 200,000 gallons of water would be pumped from Clocktower Creek and hauled to the road construction site to be used for construction of the road. Estimated costs of constructing the road could exceed $70,000 per mile. Reclamation of the road after well abandonment would last at least as long as construction and costs would probably exceed $60,000 per mile. All personnel, equipment, and supplies would be trucked to the well site.

Water would also be trucked to the well, so no temporary water line would be laid from Pagoda Creek.

ALTERNATIVE III: ALTERNATE LOCATION

Under Alternative III, the well would be drilled in Section 28, T52N, R106W between June 21 and December 31. The drill site would be along Grace Creek at an elevation of 6,620 feet. A helicopter staging area would be placed along Elk Fork Creek about a mile south of the highway. An improved road to the staging area would be constructed. Helicopter mobilization would be employed as in Alternative I. Since water would be obtained from Grace Creek near the drill site, a short temporary water line would be needed. Water from Elk Fork Creek would be requested as a backup source and if needed would be transported by helicopter or temporary pipeline to the well site.

This drill site location is adjacent to Grace Creek near the mouth of a small ephemeral draw. The draw is about 200 feet wide and is bounded by very steep mountain side slopes. The slope of the draw floor is about 15 percent; the slope of the adjacent side slopes is about 70 percent. The distance to Grace Creek from the edge of the pad would be about 100 yards.

Personnel, equipment, and supplies would be trucked to the helicopter staging area and transported to the well site by a combination of helicopter, pack animal, or by foot.

ALTERNATIVE IV: NO ACTION

The "no action" alternative would preclude drilling an exploratory oil and gas well to test the target geologic structure. The APD would be denied with the inference that no other location would have less environmental impacts and at the same time allow a valid test of the lease. Under the existing lease such an alternative would be authorized only if occupancy would detrimentally affect any endangered or threatened plant or animal species. Since the biological opinion prepared by the U. S. Fish and Wildlife Service concluded that the North Fork APD is not likely to jeopardize the continued existance of any endangered or threatened plant or animal species; the "no action" alternative is beyond the BLM's authority to select.

CONSEQUENCES

Alternative I would disturb a relatively small area and increase soil erosion and sediment by insignificant amounts. Noise levels near the drill site and flight corridor would increase for a short time. Portions of big game winter range could be influenced by drilling and support activities that occur late in the year. Some big game animals could be temporarily displaced. The recreation setting would change and a relatively small amount of visitor use would be displaced for a short period of time. Grizzly bears might be displaced and the potential for grizzly bear/human conflicts might increase. Six mitigation measures were recommended for Alternative I to reduce the amount of sediment, to minimize big game displacement from winter ranges, and to reduce potential impacts on grizzly bears, and to reduce transportation impacts. Table 7 compares the unmitigated impacts with mitigated impacts for Alternative I.

The main difference between Alternatives I and II is the methods of getting to the drill site. Alternative I would require transportation of personnel and equipment with a helicopter, construction of a helicopter staging area, and transportation of water through a temporary water pipeline. Alternative II would involve the impacts of building a road and trucking personnel, equipment, and water to the drill site. Alternative II would take longer, disturb more ground, cause more impacts to Pagoda Creek, its wetlands and floodways, grizzly bears, and recreation use; and result in greater expense for reclamation. Reclaiming the road would be more difficult than reclaiming the staging area, and the long-term impacts would be greater for Alternative II.

Seven mitigation measures are recommended to minimize big game displacement and reduce potential impacts on grizzly bears, and reduce transportation impacts. Table 9 compares the unmitigated impacts with mitigated impacts for Alternative II.

Alternative III would have a different drill site (along Grace Creek) and a helicopter staging area in the Elk Fork drainage. Personnel and equipment would be transported by helicopter, horseback, or foot. Constructing this drill pad would disturb more surface and would be more difficult to reclaim. Helicopter flights from Elk Fork to Grace Creek would also cause more impacts than helicopter access up Clocktower Creek.

Alternative III would cause more impacts than Alternative I but fewer than Alternative II, except for recreation use displaced. Four mitigation measures were recommended to reduce potential impacts on grizzly bears and big game animals. However changing dates to minimize wildlife impacts would increase recreation use impacts. Table 11 compares unmitigated impacts with mitigated impacts for Alternative III.

Analysis of Alternative IV, the "no action" alternative, indicates that denying the APD would not result in any environmental impacts. Since the "no action" alternative would not allow oil and gas to be produced, it could have a detrimental economic effect on the lease holders and operators.

INTRODUCTION

BACKGROUND

This EIS addresses a proposed exploratory well in the Shoshone National Forest, west of Cody, Wyoming (Figure 1). The Bureau of Land Management (BLM) has jurisdiction over minerals in the area of the proposed drilling. The Forest Service U. S. Department of Agriculture (USFS) manages the surface. The report was prepared by the BLM in cooperation with the USFS.

Marathon Oil Company filed an Application for Permit to Drill (APD) an exploratory oil and gas well (North Fork Well) in May 1983. On the basis of the amount of public concern expressed regarding this APD, the Worland District Manager, BLM, decided that an EIS should be prepared to provide full discussion and disclosure of any significant environmental impacts that might result from the proposed well and to explore ways to avoid, minimize, or otherwise mitigate any adverse impacts. Because this exploratory well could eventually lead to future application to explore for and produce oil and gas in the surrounding area, the scope of this EIS encompasses the area identified in Figure 2.

A draft EIS was released in February 1984. A public meeting was held in March, open houses were conducted in April and May, and a public hearing was held in May. More than 500 responses were received regarding the draft EIS. All comments were considered individually and collectively. Comments received prompted the BLM to analyze two site-specific alternatives not previously given detailed consideration, to supplement and modify the analysis, and to make factual corrections. This led to issuing a second draft EIS in October, 1984.

Marathon's application for a permit to drill an exploratory oil and gas well is the only approval action being sought by Marathon at this time. Any further action involving other exploratory wells or field development would be subject to additional review under the NEPA.

The USFS and BLM may refer to this EIS in responding to future Applications for Permit to Drill (APDs) in the study area. However, a site-specific environmental analysis will be completed for each future application filed in the study area. As deemed necessary by the agencies pursuant to relevant law, cumulative impacts of field development will be addressed in subsequent analyses of specific proposed actions.

PURPOSE AND NEED

Oil and gas leases were issued in 1980 under the authority of the Mineral Leasing Act of 1920. Marathon proposes to drill the exploratory well in order to test the underlying geologic structures. However, the proposed action does not include development of the reserves, if found, and any such development would have to undergo additional environmental review under the NEPA.

GEOGRAPHIC SETTING

The proposed well site for the North Fork Well is in western Park County, southwest of Cody and east of Yellowstone National Park. It is 2 miles south of U.S. Highway 14-16-20 and 2 miles north of the Washakie Wilderness Boundary (Figure 2), in Section 34, T52N, R106W, at an elevation of 7,643 feet.

The study area consists of approximately 39,000 acres administered by the U.S. Forest Service within the Shoshone National Forest. (Figure 2). The area is bounded on the north by the North Absaroka Wilderness and on the south by the Washakie Wilderness. The study area's east boundary is 25 miles from Cody, Wyoming, and its west boundary is 19 miles from Yellowstone National Park.

A proposed helicopter staging area is located near Clocktower Creek, 2 miles northeast of the well site on an abandoned gravel quarry. Helicopters would fly up Clocktower Creek to the south and turn west toward the drill site.

INTERRELATIONSHIPS

Oil and gas leases within the study area were issued by the BLM following the decision of the Regional Forester, USFS, to recommend leasing based on the *Environmental Assessment: Oil and Gas Leasing of National Forest Systems in the Rocky Mountain Region.* (1979). The lease incorporates the pertinent stipulations developed in that document (Appendix A).

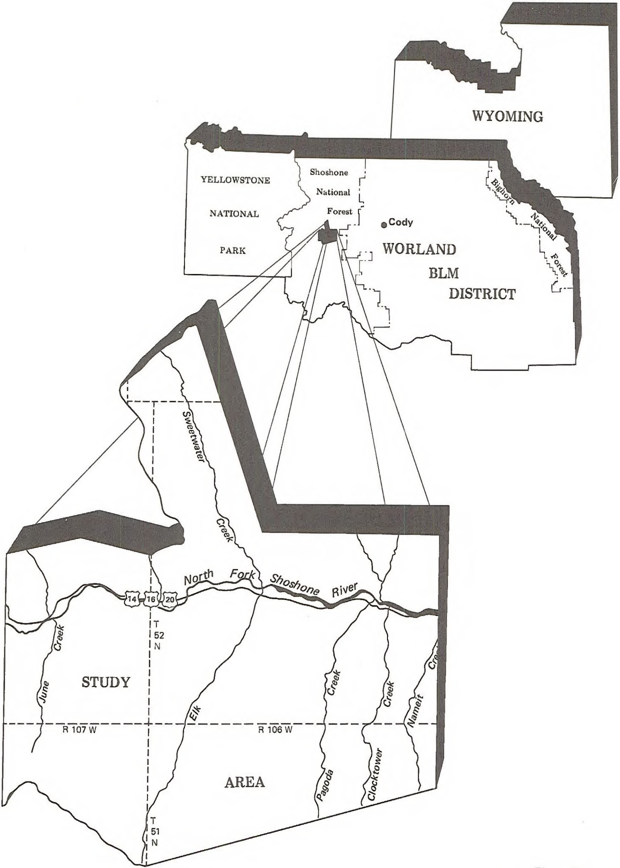
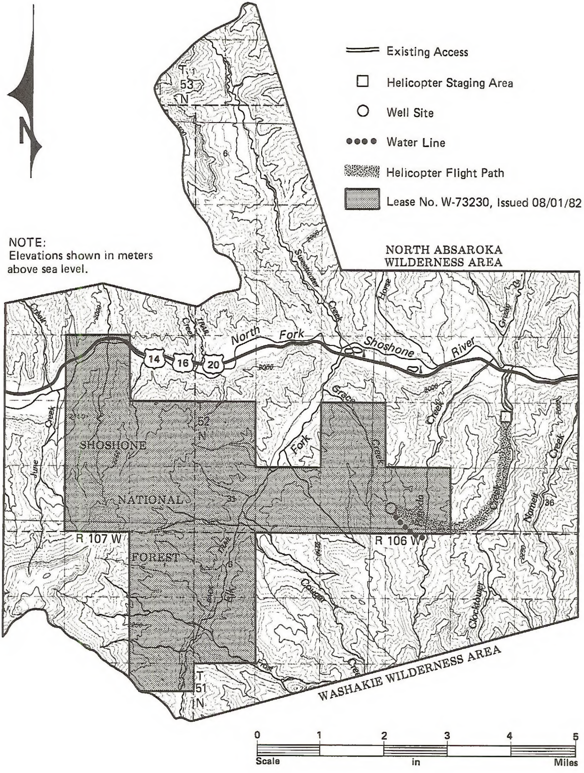


Figure 1
GENERAL LOCATION MAP
North Fork Well Study Area



NOTE:
Elevations shown in meters above sea level.

Figure 2
NORTH FORK WELL STUDY AREA
North Fork Well Environmental Impact Statement

MAJOR ISSUES AND CONCERNS

The BLM and the Forest Service received 74 letters concerning the proposed drilling before any environmental study was initiated. Fifty-nine came from local (Cody or Park County) addresses. Some concerns were mentioned a number of times, including concern for wildlife (42 times), opinion that an EIS should be prepared (38); and comments regarding wilderness (23), seismic activity (21), tourism (13), scenic quality (10), access (10), water quality (7), and Marathon's record for environmental concerns (7). Other comments dealt with housing oil and gas industry employees, local economic development, the use of helicopters, and the effects on geothermal resources in Yellowstone National Park.

A public scoping meeting was held in Cody on October 19, 1983. Approximately 150 people attended the meeting and identified the following issues and concerns:

—Effects on other commercial users
—Socioeconomic effects and the effects on the stability of the oil & gas industry
—Effects on the ability to expand the Washakie Wilderness
—Potential for retaining increased access
—Effects on public attitudes
—Effect on property values
—Effects on Federal oil and gas leasing
—Effects on rights of mineral lessees
—Effects on instream water flows
—Effects on mineral potential
—Effects on tourism
—Requirement for multiple use of the public lands
—Effects on wildlife, especially elk and bighorn sheep, grizzly bears, and threatened and endangered species
—Effects of noise on residents and other forest users
—Potential for contaminating streams
—Potential visual impacts
—Effects of additional truck traffic on the Yellowstone Highway
—Potential for hydrogen sulfide gas
—Possible dangers of using helicopters
—Potential to change the character of the area from "undisturbed" to developed.

COMMENTS ON THE DRAFT EIS's

Following issuance of the first DEIS, public comment was received during a 90-day comment period. Written comments were submitted and oral comments were received at a public meeting, a two-day open house, and a formal hearing. The major issues identified during the public comment period include general comments, comments on oil and gas development, public participation, wildlife, socioeconomic conditions, wilderness, recreation, cultural resources, water, reclamation, mitigation, air quality, transportation, rights-of-way, and others.

In the second draft EIS, we tried to address all of the substantive comments on the first EIS in the form of text revisions, where appropriate, or in Chapter IV.

In this Final EIS, we also tried to address all substantive comments in the form of text revisions. These comments are summarized along with text revisions and responses to the comments in Chapter IV.

LEVELS OF ANALYSIS

The scope of the EIS includes the following:

1. Drilling the North Fork Well. Chapter I summarizes the proposed drilling activity and abandonment under three alternatives. Chapter II describes the affected environment of the North Fork Well site. Chapter III describes the environmental consequences of drilling a well, recommends mitigating measures, and identifies unavoidable adverse impacts, short-term uses versus long-term productivity, and any irreversible or irretrievable commitment of resources.
2. Development and Production of the North Fork Well. The development and production of the North Fork Well are not part of the proposed action; however, future applications may be submitted if the well is drilled and commercial quantities of oil or natural gas are discovered. Therefore, Chapter II describes the environment surrounding the well site, and Appendix E describes what are assumed to be probable methods of developing and producing oil. Potential environmental consequences of production are also described in Appendix E, which contains a discussion of the probability of a well going to production. No action on development or production will be taken by either the BLM or the USFS at this time. However, development and production are included to provide a perspective of foreseeable actions and impacts that could result from drilling the exploratory well.

3. Development of the Area. The development of the area in terms of wells, pipelines, and roads is not part of the proposed action, and no decision concerning future development will be made by the BLM or the USFS at this time. However, if a well is drilled and commercial quantities of oil or gas are discovered, additional APDs may be submitted. Therefore, a general discussion of field development is also included in Appendix E. However due to the limited knowledge of the extent and nature of any potential reserves, it is extremely difficult to predict how any such field development might occur. Prior to field development a company can apply to the BLM for designation of a logical unit. Under the unit agreement a development plan is submitted to the BLM for approval. This is described under Lands and Special Uses in Chapter II.

The appendices are provided to help orient readers to the overall leasing and drilling process and possibilities for field development.

CHAPTER I

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

INTRODUCTION

Alternatives were identified based on input from the public and state and Federal agencies.

Many laws and policies affect oil and gas development. Some that were considered while developing and analyzing alternatives include:

—The Mineral Leasing Act of 1920, which authorizes the Secretary of the Interior to issue leases for the disposition of oil and gas deposits owned by the Federal government. Oil and gas leases in the proposed study area were issued under the above authority.

—The National Materials and Minerals Policy Research and Development Act of 1980, which states that private enterprise is to be encouraged to develop mineral resources, and that Federal Agencies are to facilitate such development.

—Water quality standards as defined in the Federal Water Pollution Control Act, as amended by the 1977 Clean Water Act. In Wyoming, these standards are implemented as set forth in the Wyoming Environmental Quality Act of 1973. The Wyoming Department of Environmental Quality issues such permits as the "National Pollutant Discharge Elimination System" (NPDES) permit (for surface discharge) and "Permit to Discharge to Groundwater" when applicable to oil and gas operations, such as disposing of produced water.

—Air quality standards as required in the Clean Air Act and, as defined by the Wyoming Air Quality Standards set forth in the Wyoming Environmental Quality Act of 1973. The Wyoming Department of Environmental Quality issues permits for long term emissions to the atmosphere in certain circumstances.

—The Endangered Species Act of 1973, which directs Federal Agencies to consult with the U. S. Fish and Wildlife Service to ensure that their actions do not jeopardize the continued existence of listed species. Formal consultation regarding the Grizzly Bear and Bald Eagle has been completed.

—The Wilderness Act of 1964, which established the National Wilderness Preservation System.

—Executive Orders 11988 and 11990, concerning the protection of floodplains and wetlands, respectively.

—The National Environmental Policy Act of 1969, which directs Federal Agencies to consider the impacts of their actions upon the environment, develop reasonable alternatives and to disclose these considerations in "a detailed statement."

—The Multiple Use-Sustained Yield Act of 1960 (16 USC 528) established the policy of Congress that the National Forests are to be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. The Multiple Use-Sustained Yield Act further states that management of National Forest System lands shall not affect the use or administration of the mineral resources in these lands.

—Executive Order 11595 directs all Federal agencies to inventory their cultural resources, to submit to the National Register of Historic Places all qualified sites meeting the criteria, and to protect all nominated sites.

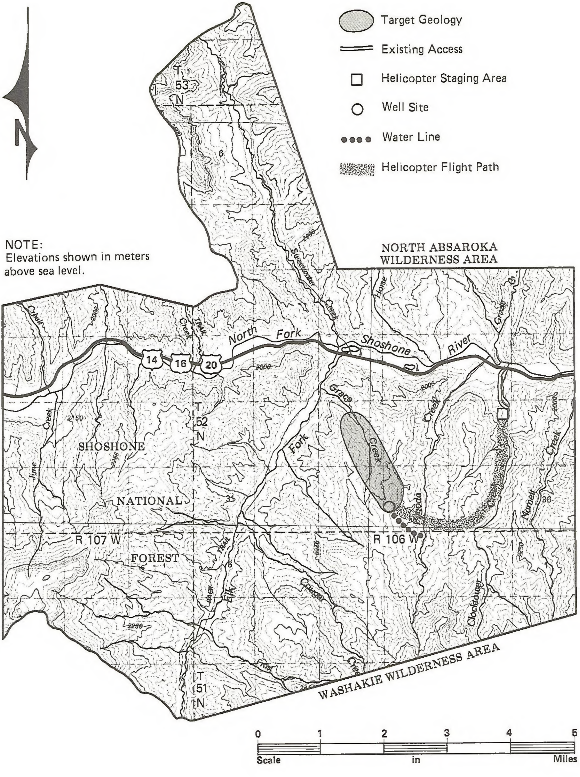
—National Historic Preservation Act of October 15, 1966 expands the national policy toward cultural resources to include those of State and local as well as national significance.

In addition, all activities will conform to standard and special oil and gas lease stipulations that apply to the existing oil and gas leases, surface and subsurface protective stipulations (Appendix A), the Oil and Gas Operating Regulations of 43 CFR Part 3160, and all written orders of Authorized Officers (Operating Orders, Notices to Lessees, and Conditions of Approval).

ALTERNATIVE I: DRILLING THE NORTH FORK WELL (PROPOSED ACTION)

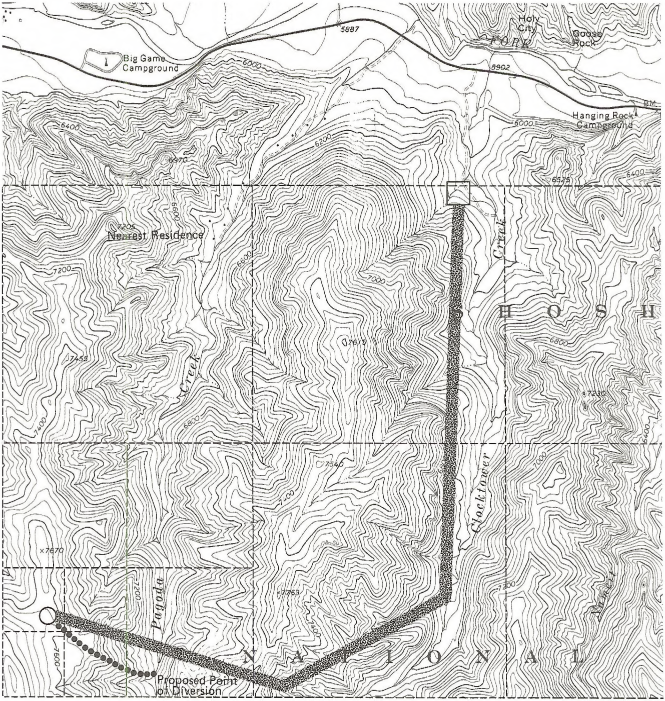
Marathon Oil Company proposes to drill a 5,000 foot exploratory oil and gas well in Section 34, T52N, R106W near Pagoda Creek (Figure 3). Support facilities would include a helicopter staging area along Clocktower Creek about one mile south of the Yellowstone Highway and a 2,550 foot long temporary water pipeline from Pagoda Creek to the well site (Figure 4). Other support facilities at the well site would include mud tanks, reserve pits, pipe racks, and covered soil stockpiles (a list of materials to be used can be found in the APD in Appendix B).

Personnel, equipment, and supplies would be trucked to a helicopter staging area and shuttled



NOTE:
Elevations shown in meters above sea level.

Figure 3
ALTERNATIVE I
LOCATION OF WELL SITE
North Fork Well Environmental Impact Statement



▨ Helicopter Flight Path

○ Proposed Well Site

□ Helicopter Staging Area

●●●●●●●● Temporary Water Line

Figure 4
ALTERNATIVE I
PROPOSED HELICOPTER FLIGHT PATH
AND STAGING AREA
TEMPORARY WATER LINE,
POINT OF WATER DIVERSION
North Fork Well Environmental Impact Statement

to the proposed location by helicopters. Helicopters would fly up Clocktower Creek to the south then west toward the drill site to avoid flying over summer cabins on Pagoda Creek. The staging area would be placed off Highway 16 approximately 1 mile up Clocktower Creek, to an area previously used as a gravel pit. The helicopters would haul an estimated 910 loads and have an estimated flying time of 162 hours. Table 1 lists the materials that will be flown to the well site and the estimated flying hours.

TABLE 1

HELICOPTER LIFT AND FLYING HOURS

Lift Description	Columbia Boeing Vertol 107
Avg. Lift Capacity (lbs)	4,500-5,000
Loads to move rig, in & out	400 = 70 hrs.
Total sacks of mud	6 pallets w/maximum of 6,400 lbs. ea. (30,000 lb. total)
Loads for mud	6 = 1 hr.
Total sacks of cement	450 sack - 7 pallets w/maximum of 6,000 lb. ea.
Loads for cement	7 = 1 hr.
Loads for 2 D-5 Cats	16 = 3 hrs.
Loads surface casing	15 = 3 hrs.
Loads intermediate casing	9 = 2 hrs.
Drilled solids, surface	62 = 9 hrs.
Drilled solids, intermediate	29 = 4 hrs.
Loads to change out drill string	36 = 6 hrs.
Testing & coring	6 = 1 hr.
Logging Unit	6 = 1 hr.
Subtotal of "Tangible" loads	590 = 102 hrs.
Rig Fuel & Air Fuel, 1,500	50 = 9 hrs
Location cleanup	35 = 6 hrs.
Roundtrip time from homebase	10 hrs.
Total (excl. personnel)	675 = 127 hrs
Personnel	200 = 30 hrs.
Miscellaneous (5%)	35 = 5 hrs.
Total	910 = 162 hrs.

Source: Marathon Oil Company

At the well site an area 75 feet by 80 feet will be graded nearly flat for the drill pad and reserve pit. The pit would be 10 feet deep. The topsoil would be bladed to one side and stockpiled in an area not to be disturbed. Construction materials would consist of soil encountered within the boundary area of the proposed site; that is, on-site materials would be used and no soil material would be flown in. The reserve pit would be constructed by bulldozing and blasting so that at least half the depth of the pit would be below the natural ground line. Impermeable plastic would be used to line the reserve pit and to protect the soil on the drill pad and in the stockpiles.

The drilling rig, pipe rack, generator, tool house, and drilling mud pump, pit, and supply platform would all be built on the drill pad. A blooie pit to contain cuttings and dust encountered in air drilling would be dug with a tracked vehicle and blasted with dynamite. The 60 feet by 20 feet pit would be 10 feet deep and disturb about 0.1 acre north of the drill pad.

Lease stipulations prohibit drilling before September 8; therefore, the starting date would be later in the fall. Activity, including construction, drilling, and well completion, could continue for 2 to 4 months. All activity must be completed by December 31. Approval of this APD would not include approval of production facilities. A separate application for production facilities would be required if the well is a producer.

Building the staging area, pad, pits, etc. would require 20 to 25 people working for 10 days. Drilling would take 4 to 6 weeks and employ 2 shifts with 15 people working each shift. Drilling would continue day and night. Decommission would involve 15 to 20 people working for about seven days. Unlike drilling, set up and take down would occur during daylight hours only.

Drilling would be started by *spudding in* the well, that is, starting the hole. The initial drilling would proceed rapidly, and generally a string of surface casing would be set before harder, deeper formations are encountered. Surface casing is a long steel pipe that would be cemented into the well and set deep enough to protect the well from cave-ins of loose formations commonly found near the surface. Marathon would set their surface casing at 2,060 feet, sealing the entire depth of volcanics. Because of the structurally complex nature and lack of subsurface information of the area, intermediate casing would be set from 1,960 feet to 4,120 feet. This casing would isolate all formations, and therefore prevent contamination of any groundwater that might be encountered.

As drilling progresses, samples of drill cuttings would be examined to determine their potential for oil and gas. If the potential is low, the well would be abandoned, and all the fresh water, oil, and gas zones must be plugged (isolated) to prevent contamination. The hole would then be cemented off and marked on the surface. The final step would be to reclaim the area until it resembled its original condition as nearly as possible. The reserve pit and any cuts would be filled, leveled, or sloped as needed. Top soil would be respread and the area would be revegetated with a mixture of Idaho fescue and hard fescue. The staging area would be revegetated with such species as basin wild rye, bluebunch wheatgrass, fescues, and possibly some bromes, Lewis flax, and arrowleaf balsamroot.

Reclamation of disturbed areas at the well site and staging area would begin in the fall, according to the guidelines set in the *Surface Operating Standards for Oil and Gas Exploration and Development* prepared by the U.S. Department of the Interior.

If it becomes necessary to use mud as the circulating medium cutting and drilling fluids would be put in the reserve pit, flown by helicopter to the staging area, transferred to a truck, and disposed of in an approved disposal facility in the Oregon Basin Oil Field east of Cody. Produced fluids from drilling operations would be gauged on-site and properly reported before being transported into Oregon Basin for treatment. Garbage and waste material would be flown to the staging area and then hauled to an approved sanitary landfill. The membrane reserve pit liner with an expected life in excess of 20 years would be left in place after the fluids are pumped out leaving a residue of drill cuttings. The liner would then be folded over and at least three feet of soil placed over the liner to prevent migration of residue. The reserve pit would be backfilled.

When an oil and gas well is drilled, there are some safety precautions that must be taken. These are a hydrogen sulfide contingency plan and a blowout prevention plan, which are included in the APD (Appendix B).

Since hydrogen sulfide gas often occurs in the Phosphoria Formation, a hydrogen sulfide contingency plan is included as a safety precaution. Hydrogen sulfide is extremely toxic, so a contingency plan was developed to outline the operational procedures to be followed to provide maximum safety for anyone near the well. The plan includes responsibilities and duties, drilling equipment layout, treatment for hydrogen sulfide poisoning, and emergency drills. The complete plan can be found attached to the APD in Appendix B.

Blowouts can occur when the pressure of the formation exceeds the pressure of the drilling fluid. This is why the drilling fluid is changed as the hole is deepened. Drilling with air or air/mist (air-water mixture) would be used in low pressure, shallow formation, and chem-gel (mud) would be used in deeper formations with higher pressures. The blowout prevention plan includes a schematic of the proposed blowout preventer installation, the maximum anticipated formation pressure, the drilling fluid program, the testing procedures and frequency, and delegation of responsibilities in case of an emergency.

A temporary water pipeline, 2 ⅞ inches in diameter and 2,550 feet long, would be laid from Pagoda Creek to the proposed well site (Figure 3). A request for a temporary permit for water would be filed with the State Engineer's Office to use 16,800 gallons of water per day from Pagoda Creek. Water from Clocktower Creek would be requested as a backup source, and if needed, it would be transported from near the staging area to the proposed well site by helicopter. The water from Pagoda Creek would be stored in two storage tanks located near the drill pad (see Exhibit "J" in APD), and would be used to mix drilling mud, clean equipment, cool engines, and other uses. If additional water is needed, in the case of lost circulation, it would be pumped directly from Pagoda Creek, or hauled in by helicopter from Clocktower Creek.

ALTERNATIVE II: ACCESS BY ROAD

Under Alternative II, the well would be drilled at the operator's proposed location, and in the same time period and manner as Alternative I, but access would be by road instead of by helicopter. All aspects of drilling would be the same as for Alternative I, but construction and reclamation work on the access road would add 4 to 8 months to the project. Since surface use or occupancy is limited to a period between September 8 and December 31, reclamation work would probably be completed the following year unless the limited surface use stipulation is modified.

No helicopter staging area would be built since access by helicopter would not be necessary. Instead, an improved 4-mile (crowned and ditched) road would be constructed along the route shown in Figure 5.

Constructing the road would take from 2 to 4 months depending on the number of men and equipment employed.

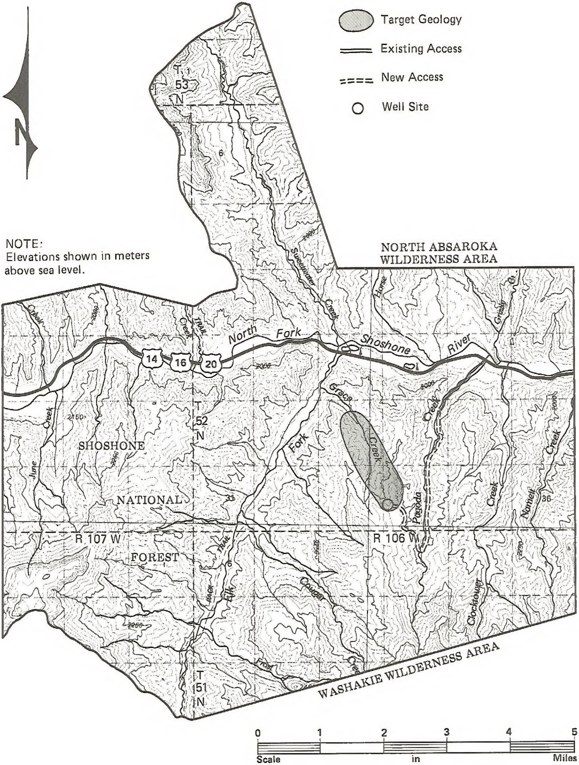


Figure 5

ALTERNATIVE II

LOCATION OF WELL SITE AND ACCESS ROAD

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Road construction materials such as gravel would be available from the reclaimed gravel pit along Clocktower Creek. This is the proposed staging area in Alternative I. An estimated 200,000 gallons of water would be used in constructing the road. This would be pumped from Clocktower Creek and hauled to the road construction site. Estimated costs of constructing the road could exceed $70,000 per mile. Reclamation work on the road after well abandonment would be at least as long as construction and costs would probably exceed $60,000 per mile.

Water would be trucked to the well, so no temporary water line would be laid from Pagoda Creek.

The access road must be surveyed and designed by or under the direct supervision of a registered professional engineer.

Roads must be designed with the purpose of fitting the roadway to the terrain. The objective is to minimize earthwork and the area disturbed.

The operator would ensure that the road is constructed according to plans and specifications approved by the Forest Service. Forest Service Standard Specifications for the Construction of Roads and Bridges would be used to establish and maintain constructed standards.

ALTERNATIVE III: ALTERNATE LOCATION

Under Alternative III, the well would be drilled in Section 28, T52N, R106W. The drill site would be along Grace Creek at an elevation of 6,620 feet. A helicopter staging area would be placed along Elk Fork Creek about a mile south of the highway. An improved road to the staging area would be constructed (Figure 6). Helicopter mobilization would be employed as in Alternative I. Since water would be obtained from Grace Creek near the drill site, a short temporary water line would be needed. Water from Elk Fork Creek would be requested as a backup source and if needed would be transported by helicopter or temporary pipeline to the well site.

This drill site location is adjacent to Grace Creek near the mouth of a small ephemeral draw. The draw is about 200 feet wide and is bounded by very steep mountain side slopes. The slope of the draw floor is about 15 percent; the slope of the adjacent side slopes is about 70 percent. The distance to Grace Creek from the edge of the pad would be about 100 yards.

Personnel, equipment, and supplies would be trucked to the helicopter staging area and transported to the well site by a combination of helicopter, pack animal, or by foot.

Lease stipulations prohibit drilling in Section 28 between January 1 and June 20.

Construction of a suitable pad would require excavation of at least one side of the draw, resulting in a 100- to 150-foot cut slope. Some of this cut slope would be in bedrock. Rock gabions and channel development would be necessary to protect the pad from sudden "gully washers."

All details of the construction and drilling operations (other than location) would be the same as for Alternative I except that the the helicopter flight path would be approximately 0.8 miles long.

ALTERNATIVE IV: NO ACTION

Scope

Although the "no action" alternative would not allow a valid test of the operator's lease, the NEPA requires that a "no action" alternative be considered in all environmental documents. For the North Fork Well proposal the "no action" alternative would preclude drilling an exploratory oil and gas well to test the target geologic structure. The APD in question would be denied, with the inference that no other locations would have less environmental impacts and at the same time allow a valid test of the lease.

An oil and gas lease grants the "right and privilege to drill for, mine, extract, remove and dispose of all the oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease. The denial of the right to drill would void the lessee's contractual rights unless the lease itself reserved the right to implement the denial of such activity. (See *Sierra Club v. Peterson, 717 F.2d 1409* (D.C. Cir. 1983). Therefore, analysis of the "no action" alternative must include an examination of the relevant oil and gas lease before the alternative can be considered further.

Oil and gas lease W-73230 contains various stipulations indicating that before approving any surface-disturbing activity, the Department of the Interior may impose "such reasonable conditions, not inconsistent with the purposes for which...[the] lease is issued, as the...[BLM] may

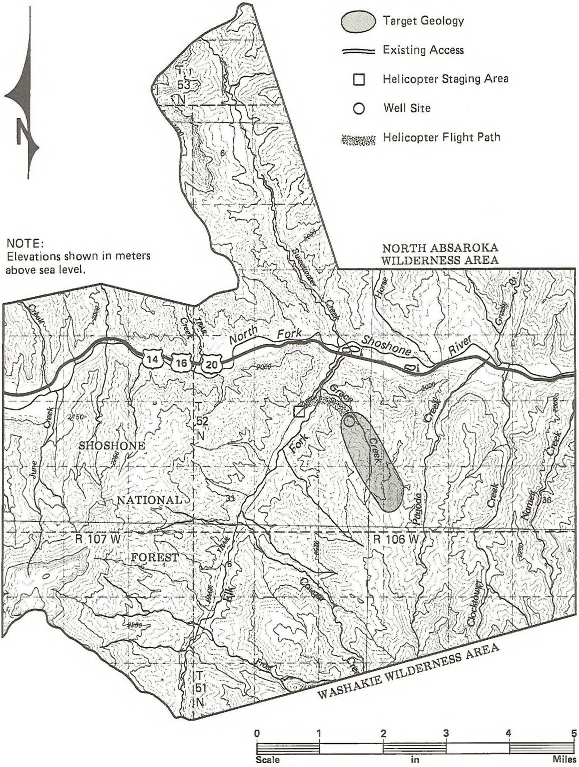


Figure 6

ALTERNATIVE III
LOCATION OF WELL SITE AND
HELICOPTER FLIGHT PATH

North Fork Well Environmental Impact Statement

require to protect the surface of the lease lands and environment." With one exception, however, none of the stipulations would enable the Secretary of the Interior to deny all drilling activity because of environmental concerns. The provision that expressly empowers such denial reads as follows:

> The Forest Service is responsible for assuring that the area to be disturbed is examined, prior to undertaking any ground disturbing activities on lands covered by this license/permit/lease, to determine effects upon any plants or animal species listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow any use and occupancy that would detrimentally affect any of the endangered or threatened plant or animal species.

The stipulation, however, only empowers the discretionary rejection of all activity in limited circumstances; namely, in the instances in which use and occupancy would "detrimentally affect" certain endangered or threatened species as determined by the USFS. Therefore, the discussion of the no action alternative was divided into two sections. The first considered the situation where the threshold existed for triggering the authority to reject. The second considered the alternative when the precondition in the lease for denial is not present.

"No Action" as Authorized by Lease

Chapter II contains analysis of the possible presence of threatened or endangered species of plants and animals in the study area and Chapter III contains discussions of the consequences of the various alternatives on the species considered. The biological assessment reveals that there would be no detrimental effect on the peregrine falcon or gray wolf; however, Alternatives I, II and III may effect grizzly bears and bald eagles. The U.S. Fish and Wildlife Service further considered the possibility of adverse effects on the grizzly bear and bald eagle. The BLM requested the agency's biological opinion under section 7 of the Endangered Species Act of 1973. (Appendix H) Since the biological opinion prepared by the U. S. Fish and Wildlife Service concluded that the exploratory phase is not likely to jeopardize the continued existence of any endangered or threatened plant or animal species; the "no action" alternative is beyond the BLM's authority to select.

"No Action" Pursuant to Extra-Lease Authority

Since the Secretary of the Interior has no authority to deny all activity upon the lease except as described above, congressional action would have to be sought to authorize exchange, condemnation, or buy-back of the subject lease and possible other leases in the study area. The Secretary could only suspend the leases pursuant to section 39 of the Mineral Leasing Act pending consideration by the Congress of a grant of authority to preclude drilling and provide recompense to the lessees.

This aspect of the "no action" alternative has been considered but discarded, since Congress has given no indication to the agencies involved that it is considering action on the matter. The prospect of securing passage of such legislation and appropriation of funds for that purpose is remote; the geologic inferences are such that the cost would be very high, and litigation of values would surely be required.

SUMMARY COMPARISON OF ALTERNATIVES AND IMPACTS

The drilling operations for Alternatives I and II would be about the same. The main difference between these alternatives would be the methods of getting to the drill site. Alternative I would require transporting personnel and equipment by helicopter, constructing a helicopter staging area, and transporting water with a temporary water pipeline. Alternative II would involve building a road and trucking personnel, equipment, and water to the drill site. Alternative II would disturb more ground, cause more impacts, and require more expensive reclamation. Reclaiming the road would be more difficult than reclaiming the staging area, and the long-term impacts would be greater for Alternative II.

Alternative III proposes a different drill site (along Grace Creek) and a helicopter staging area in the Elk Fork drainage. Personnel and equipment would be transported by a combination of helicopter, horseback, or foot. Constructing this drill pad would disturb more surface, and reclamation would be more difficult. Helicopter flights from Elk Fork to Grace Creek would also cause more impacts than helicopter access up Clocktower Creek.

Alternative IV, would not cause any surface impacts, but denial of the APD could have a detrimental economic effect on the lease holders and operators. Table 2 summarizes the impacts that would occur from each alternative without mitigation.

THE AGENCY'S PREFERRED ALTERNATIVE

On the basis of the analysis contained in the DEIS, the BLM identified Alternative I, the proposed action, as the agency's preferred alternative. Of the three alternatives that would permit drilling, Alternative I best satisfies the criterion of allowing a valid test of the oil and gas potential of the target structure while holding environmental impact to a minimum. Measures for minimizing environmental impacts are incorporated in the operator's plan.

The BLM also prefers the following mitigation measures as condition of approval to avoid or minimize the potential for adverse impacts.

1. Any vegetation removed for the surface water pipeline will be removed with hand tools and chain saws. All disturbed soils will be revegetated and water bars will be placed to reduce soil loss and stream sediment.
2. Lease stipulation C (Part 3) which prohibits any surface use between June 15 and September 7, shall be modified. All drilling and associated activity will begin after June 20 and be completed before December 1 to minimize big game displacement from winter ranges and to reduce potential impacts on grizzly bears.
3. All garbage will be flown to the staging area daily. All garbage will also be hauled from the staging area to sanitary landfill at least every other day. All food hauled to the drill site and garbage temporarily stored at the drill site or staging area will be stored in containers that would be inaccessible to bears.
4. Crews will not be allowed to carry firearms while working at the drill site or staging area

TABLE 2

SUMMARY OF ESTIMATED IMPACTS BY ALTERNATIVE

		ALTERNATIVE			
		1	2	3	4
Area Disturbed	Acres	3	14	11	0
Area Permanently Impaired	Acres	0	11	0	0
Soil Erosion Increased	Tons	20	750	158	0
Sediment Yield Increased	Tons	2	70	14	0
Wetland Characteristics Altered	Acres	0	60	9	0
Floodways Altered	Acres	0	15	9	0
Noise Level Increased at Well Site	dBA	64	50	64	0
Noise Level Increased Along Access Corridor	dBA	50	60	50	0
Elk Winter Range Influenced	%	17	19	8	0
Elk Displaced	No.	0-289	0-323	0-136	0
Mule Deer Winter Range Influenced	%	3	3	3	0
Mule Deer Displaced	No.	0-36	0-36	0-36	0
Bighorn Sheep Winter Range Influenced	%	8	8	8	0
Bighorn Sheep Displaced	No.	0-105	0-105	0-105	0
Moose Yearlong Range Influenced	%	1	1	1	0
Moose Displaced	No.	0-1	0-1	0-1	0
Recreation Setting Changed	Acres	2,000	1,700	800	0
Recreation Visitor Days Displaced	RVDs/yr	30	50	350	0

NOTE: These impacts are without mitigation.

or while traveling to or from the drill site. Marathon Oil Company will be responsible and accountable for enforcement.

5. All human activity may be temporarily stopped if necessary to resolve grizzly bear/human conflicts. See management measures for grizzly bears as stated in the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" for Management Situation 2 (Appendix I).
6. Marathon will have an approved application for approach on to Highway 14-16-20 prior to beginning any work on the Helicopter Staging Area. The application must meet the approval of the Wyoming State Highway Department's District Engineer.

Although Alternative IV, the "no action" alternative, was deemed legally unavailable for the exploratory drilling phase of the North Fork Well APD; the BLM fully considered whether or not it would have been the preferred alternative had it been within the agency's authority to select. Due to the level of anticipated impacts to grizzly bears and bald eagles identified by the U. S. Fish and Wildlife Service and the analyses of other resources contained in this document, the BLM still would have preferred Alternative I.

For the same rationales presented in the DEIS, the USFS selected Alternative I as its' Preferred Alternative. This Alternative appears to be sensitive to the natural and social resources of the area, responsive to legal and Congressional intent, and best serves the Forest Service's mandate to manage for the multiple use of National Forest lands "for the greatest good for the greater number in the long run."

The USFS also agrees with the analysis given Lease Stipulation C (Part 3), i.e., to modify it to allow drilling activity between June 20th and December 1st.

As originally applied, this portion of Stipulation C served to notify a lessee that operations could well be curtailed due to special recreational values existing on the lease. The lease stipulation is worded to the effect that, if satisfactory modifications are submitted to the Forest Service which protect these special values, then the activity can be permitted.

The Forest Supervisor feels that such modifications have been submitted, in the form of the special operational parameters given in Alternative I, such as helicopter-based operations, and the selection of a location possessed of low visual impact.

By modifying this portion of the "C" Stipulation, very intense drilling activity during the hunting season, when most of the limited recreation use of this area occurs, will be avoided. Further, given a longer operating period, the intensity of the activity should be less. The helicopter-intensive set up period would also be over prior to the hunting season.

ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

All alternatives were screened using predetermined reasonableness criteria. The alternatives already discussed met the criteria but several did not and they were, therefore, considered but not given further detailed analysis in this document.

Criteria

All alternatives identified during the scoping process were judged against the following six criteria:

1. Would the alternative accomplish the objective of allowing a valid test of the operator's lease? Although the No Action Alternative does not meet this criteria, the NEPA requires that a "no action" alternative be considered in all environmental documents.
2. Is the alternative technically feasible?
3. Would it entail obviously unacceptable environmental impacts that exceed thresholds based on sound planning and resource use?
4. Is it legal?
5. Is it economically feasible?
6. Would it cause unacceptable impacts on the public health and safety?

On the basis of these criteria, the following alternatives shown on Figure 7 were eliminated from active consideration:

Drill Well at Ridge Site With Helicopter Access

An alternative was suggested that would have

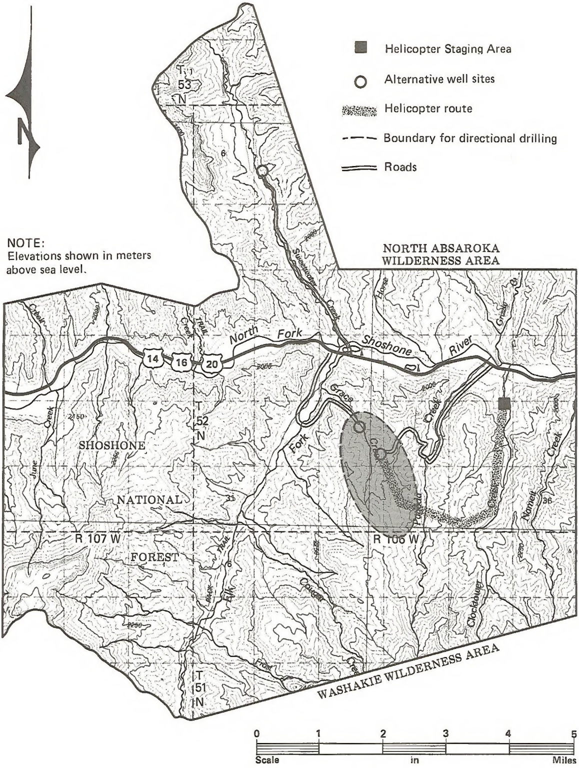


Figure 7
ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL
North Fork Well Environmental Impact Statement

provided for drilling the exploratory well in Section 28, T52N, R106W, (the Ridge Site) with helicopter access.

Although this alternative might not have violated the above criteria, the total anticipated environmental impacts would have been of such magnitude that it was not considered for detailed analysis. Building the location would have caused considerable impacts on soils and the surface hydrologic regime. Large amounts of side cast material generated by cuts of 50 to 80 feet into the ridge top would have created sediment loads in the Grace Creek drainage that could violate legal water quality standards. The impact on visual resources would have been severe and irreversible. The potential for adequate reclamation would have been poor and reclamation costs would have been extreme.

Drill Well at Ridge Site with Road Access

Another suggested alternative would have provided for drilling the exploratory well at the Ridge Site with road access described above. This alternative would have had the same impacts as above except that the impacts resulting from road construction would have increased the potential for violating the criteria.

Drill Well at Grace Creek with Road Access

An alternative was suggested that would have provided for drilling the exploratory well at the Grace Creek Site described for Alternative III, but with road access. This alternative would have violated criteria 3 and 4 because building the location, and especially the road, would have caused severe impacts on soils and the hydrologic regime. The proposed road would have traversed mountain side slopes of 40 percent to vertical, generating excessive amounts of sediment directly into Grace Creek and resulting in unmitigable impacts on the water resource severe enough to violate legal water quality standards. The impact on visual resources would have been severe and irreversible. The potential for adequate reclamation would have been extremely poor, if not impossible, in an area visible from the Elk Fork Creek corridor—an intensively used recreation area.

Directional Drilling

Directional drilling was proposed from any of several locations in another suggested alternative. This would not have met criteria 1 and 2 at the same time. The relatively shallow depth and the complexity of the geology would have allowed only a small amount of deflection and certainly not enough offset to move the drill site into an area with significantly less impact. Directional drilling increases the uncertainty of the operation; thus, it would have increased the likelihood that the objective might be missed, invalidating the test.

Exploratory Drilling on Sweetwater Creek

A proposed alternative to drill an exploratory well on Sweetwater Creek would not have met criterion 1 since this is off lease and would not test the target geologic structure. The northern structure is less defined seismically than the southern. Any information gathered from this test would have been of limited use in determining the oil and gas potential of the study area and may be of no benefit to the applicant. Therefore, this would not have accomplished the objective of allowing a valid test.

Multiple Production

A suggested alternative would have provided for multiple production from one well head. The reasons that directional drilling is not feasible also apply to this alternative. Although this is a subject of public interest, multiple production is beyond the scope of this EIS.

Rerouting and Improving Highway

A proposed alternative involving improving and rerouting the Highway around Buffalo Bill Reservoir would not have met criterion 4. This, too, is a topic of public interest but beyond the scope of BLM's authority. The BLM has no legal authority to compel an operator to rebuild state highways where there is no direct impact. The existing highways are considered adequate to handle the expected traffic. This alternative is therefore rejected under criterion 4.

Delayed Action

This was suggested to supplement the "no action" alternative to allow time to develop data bases for air and water; to allow time for the U. S. Fish and Wildlife Service's biological opinion on threatened or endangered species to be included; and to allow time for the USFS Management Plan to be completed.

Although this might not violate any of the criteria for eliminating an alternative from detailed consideration, it is not a viable alternative by itself. The Shoshone National Forest Land Use Plan is scheduled for public release in March of 1985. The biological opinion has been issued (Appendix H).

Environmental analysis of potential air and water impacts described in Chapter III does not indicate a need for additional data bases to assess impacts. For example, drilling would cause only minor air quality impacts unless a gas blowout occurred. However, the likelihood of a blowout or spill is extremely small with the operating practices described in the APD. Similarly, the drill site is sufficiently far from surface and ground water supplies that no significant impacts to these resources are anticipated. Nor would anticipated impacts to stream flows be significant. For example, according to the USFS projections, the estimated September stream flow in Pagoda Creek is about 170 acre feet of water. A permit for 16,800 gallons per day would use approximately 1.6 acre feet per month or about one percent of the estimated stream flow.

CHAPTER II

AFFECTED ENVIRONMENT

INTRODUCTION

This section describes the physical and biological resources within the study area that would be affected by oil and gas operations. Since grazing management and fire management would not be affected by oil and gas drilling, they are not discussed. The resources and uses in the sections that follow are discussed to provide a basis for analysis or to respond to public concerns.

GEOLOGY

The region encompassing the study area was an area of deposition throughout most of geologic history. It is estimated that there are several thousand feet of accumulated sediments in the vicinity of the proposed well. The present-day structure of the Big Horn Basin was formed during the Laramide Orogeny in the early Tertiary period by peripheral mountain-building basement uplifts. The strata near these uplifts were faulted and folded, forming structures that can often trap and accumulate quantities of oil and gas present in source rocks. Thus, oil and gas fields in the Big Horn Basin are found along the basin margin. The proposed oil well would represent an attempt to determine if a trend of fields such as Sheep Point, Fourbear, TE Ranch continues to the north.

In the study area, the pre-Tertiary strata are overlain by the Wapiti Formation, a series of volcanics deposited relatively recently (during the Middle Eocene). Later intrusions of granodiorite and diorite have domed, fractured, and metamorphosed these volcanics. This overlying formation obscures the complex geology of the strata below. As a result, little is known of the subsurface geology. It can only be assumed that it would be similar to that encountered in areas to the south and east not covered by the Wapiti Formation.

The closest well that has been drilled is in SWSE Section 8, T52N, R105W, approximately 5.5 miles east-northeast of the proposed North Fork Well site. The well in Section 8 and three other wells nearby were dry holes. A well in SESW Section 15 T52N, R105W, approximately 7 miles east-northeast of the proposed well site was drilled, plugged, and abandoned in 1984. But, the closest producing well is 13 miles southeast of the North Fork site in the TE Ranch Known Geologic Structure (KGS); production is from the Dinwoody and Phosphoria formations.

Figure 8 is a time structure map near the Madison Formation the map shows the proposed North Fork Well site. The lines in the map generally correspond to the geologic structure of the area, indicating that the area around the proposed well site is a structural high and therefore should have the highest potential for hydrocarbon accumulation.

The Shoshone River drainage includes volcanic and sedimentary rocks, over which the Heart Mountain detachment blocks moved. Detached Heart Mountain fault blocks are scattered throughout the surface Wapiti Formation and rest on Upper Cretaceous and Tertiary rocks that may have been thrust faulted. Deformation due to crustal instability is present, with expressions ranging from gravity sliding of detached blocks to igneous extrusion. It appears that faulting and volcanic burial were not simultaneous cataclysmic events.

The area of the proposed site of the North Fork Well is between Risk Zone 1 and 2. Areas within Risk Zone 1 may experience earthquakes with a maximum intensity of V to VI on the Mercali Scale; areas within Risk Zone 2 may experience earthquakes with a maximum intensity of VII (Algermissen, 1969). See glossary for discussion of intensity and magnitude. There are no active faults (USGS Open File Report 75-279) or historic epicenters within 12 miles of the area. From 1965 to 1967 there were a few tremors 12 miles north of the proposed well site near Black Mountain. The tremors ranges from 3.3 to 3.9 on the Richter scale. The maximum earthquake magnitude expected in the North Fork Well area in a 250-year period is 5.2 to 5.8; in a 50-year period it is 4.5 to 5.2; and in a 10-year period it is 4.0 to 4.5. During an earthquake with a magnitude of 4.0, the ground shaking can be felt by all, weak structures such as those of adobe fall, and trees

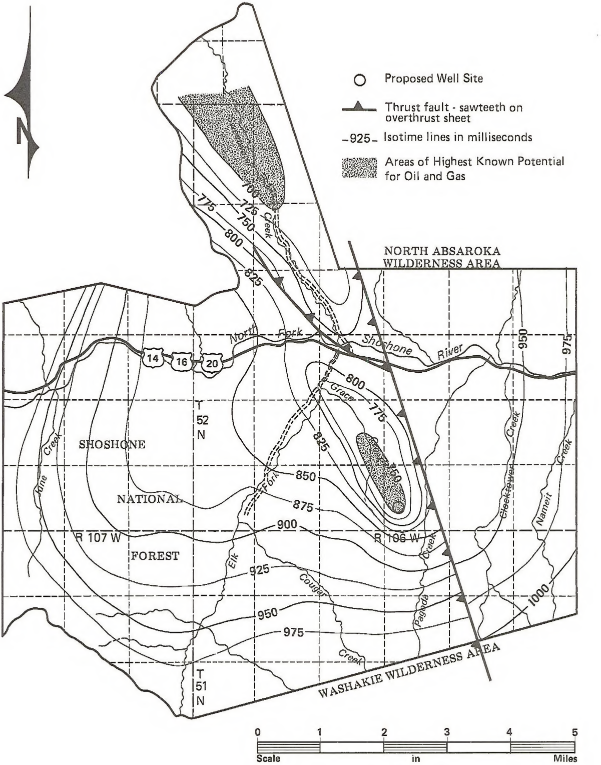


Figure 8
TIME STRUCTURE
NEAR MADISON FORMATION
North Fork Well Environmental Impact Statement

and bushes shake (Pratt, et al, 1978). If an earthquake of that magnitude occurred within 12 miles of the North Fork Well site, the site would not be affected. It appears that the probability of a damage-causing earthquake in the area is low.

There are five occurrences of hydrocarbons in geothermal areas in northwest Wyoming. These localities form a southeastward-eastward trending arc some 70 miles long. Three are north-northeast of Yellowstone Lake, one is on Sweetwater Creek 3.5 miles north of the Shoshone River, and one is at Cedar Mountain. The locality at Sweetwater Creek is most relevant of the five because it lies approximately 4 to 5 five miles north of the proposed well location. A mineral spring is located a few hundred feet north of a hydrocarbon seep and just 500 feet above the base of the volcanic rocks. Hydrothermal activity can be related to intrusive masses below the Paleozoic rocks, although a model of the Cody hydrothermal system suggests that the water can absorb heat from the earth's normal temperature increase with depth while flowing through a syncline. It is believed that hot water liberated the hydrocarbons from source sediments and that the oil migrated upward along buried fault planes from deeply buried, probably Paleozoic, formations.

Spring occurrence appears to be structurally controlled by faults and fissures. The faults, which are fairly numerous both east and west of the location, are usually normal and trend in a north-south direction. The presence of sulfur, travertine, and gas vents at Sweetwater indicates a thermal area; however, the water is now cold. Although it cannot be proven that drilling a well in the proposed area would not affect surrounding geothermal areas, the suggestion appears unlikely with the near presence of a thermal spring, now cold, and the structural controls of north-south trending faults.

Between 1975-77, the Bureau of Mines, together with the U. S. Geological Survey, conducted a mineral survey in the general vicinity of the project site; results of that examination indicated copper-molybdenum porphry systems with associated veins of base and precious metals (Geological Survey Professional Paper 1300). Additionally, copper, uranium, gold, bentonite, and low quality coal have been produced from surrounding areas and elsewhere in the Big Horn Basin.

SOILS AND VEGETATION

Soils

Generally the study area is characterized by rugged and steep dissected mountain slope landforms. Major streams such as Elk Fork and the North Fork transect the area, forming gently sloping bottomlands. A few broadly convex mountain tops occur along the main ridges.

Dissected mountain slope land types compose about 85 percent of the study area; ridgetop land types compose about 3 percent . Bottomlands make up the remaining 12 percent.

About 65 percent of the study area is characterized by timber (forest) vegetation, 25 percent is grass/sage, and about 2 percent has riparian vegetation. The rest of the area is classified as rock outcrop or river wash.

Soils throughout the area are coarse textured loams, clay loams, or sandy loams varying in depth from a few inches to many feet. Generally, soils on the dissected mountain slope land type group average less than 3 feet thick. Soils occurring on timbered slopes are often thicker than 3 feet; those occurring on warm, southerly slopes are often less than 1 foot thick. Soil depths on the broadly convex ridgetops are more predictable, with soils under timber nearly always 3 to 4 feet thick and those under grassland usually less than 1 foot thick. Soils that occur on bottomlands are usually thicker than 10 feet.

The bottomland soil is timbered. About 50 percent of the mountain slope soils are heavily timbered, 25 percent are grassland, and 25 percent scattered forest. The ridgetops support about 70 percent grassland and 30 percent timber.

Descriptions, analyses, and interpretations of the various land type associations and a detailed description of soils and vegetation are available in forest records of the Shoshone National Forest Supervisor's Office in Cody.

The proposed site is located on a broadly convex ridge on a bedrock member of the Absaroka volcanic field. On the basis of observations of nearby outcrops, it is presumably a breccia of the Wapiti Formation. The soil is extremely shallow over the entire area, averaging about 7 inches and ranging from 4 to 14. It is shallowest in the vicinity of the proposed pit site. The entire soil profile from the surface to bedrock should be considered topsoil because of the grassland vegetation, which over time has produced organic matter that has been incorporated throughout the soil.

Vegetation

General

The proposed well site is a relatively flat hilltop with scattered cushion plants and low herbs among the gravel such as biscuitroot (*Lomatium attenuatum*), fernleaf springparsley (*Cymopterus bipinnatus*), townsendia (*Townsendia condensata*), sandwort (*Arenaria hookeri*), timber milkvetch (*Astragalus miser*), and cold mountain crazyweed (*Oxytropis campestris*). There are a few big sagebrush (*Artemisia tridentata*). All of these plants are abundant on other hilltops and gravel slopes nearby.

Other ridgetops and colluvial mountain gravel slopes have many of the same plants as the proposed well site. The hillsides fit the Idaho fescue (*Festuca Idahoenisis*)/bluebunch wheatgrass (*Agropyron spicatum*) habitat type. The presence of black sagebrush (*Artemisia nova*) on volcanic rock in this area is unusual. Steep slopes pose great difficulties for revegetation. However, there is plenty of suitable seed for revegetation from native species.

The proposed staging area is a reclaimed gravel pit. After disturbance, this site can be easily revegetated with such species as Basin wildrye, bluebunch wheatgrass, fescues, and perhaps some bromes, Lewis flax, an arrowleaf balsamroot.

The eastern part of the North Fork has a notable native flora. The relatively arid eastern slope of the Absarokas, particularly the ecotonal zone between the sagebrush-grassland and montane zones, appears to be an important local center of plant speciation. Much vegetation in the study area is in presettlement condition, and such vegetation is uncommon.

Rare and Unusual Plants

The eastern Absaroka flora features a substantial number of local (endemic) plant species. The following list indicates where the plants are found:

Pussytoes (*Antennaria aromatica*)—Cascade, Gallatin, and Carbon counties, Montana; Park County, Wyoming
Springs parsley (*Cymopterus sp*)—Park, Hot Springs counties, Wyoming
Lomatium (*Lomatium attenuatum*)—Park County, Wyoming
Penstemon (*Penstemon absarokensis*) Park County, Wyoming
(No common name) (*Shoshonea pulvinata*)—Park, Fremont counties, Wyoming
Townsendia (*Townsendia condensata*)—Park, Hot Springs counties, Wyoming

The Pussy toes, Lomatium, Penstemon, and Townsendia are found in the study area. Of these, the Lomatium and Penstemon are of concern. Lomatium is newly described by Evert (Madrono, vol. 30, pp. 143-146, July 1983). It is reasonably abundant in its geographic range, which runs from Heart Mountain south at least as far as the North Fork. Its habitats are largely steep slopes that are not subject to much disturbance. Oil development on the North Fork is unlikely to deplete the populations of this plant seriously.

Penstemon absarokensis appears to have a very limited geographic distribution; it is restricted to talus and gravel areas along the North Fork. It is found in areas near the river in the vicinity of Wapiti Ranger Station and as high as locations on slopes near 10,000 feet in the wilderness.

See Appendix C for a list of other rare plant species found in the area unlikely to be affected by the North Fork Well.

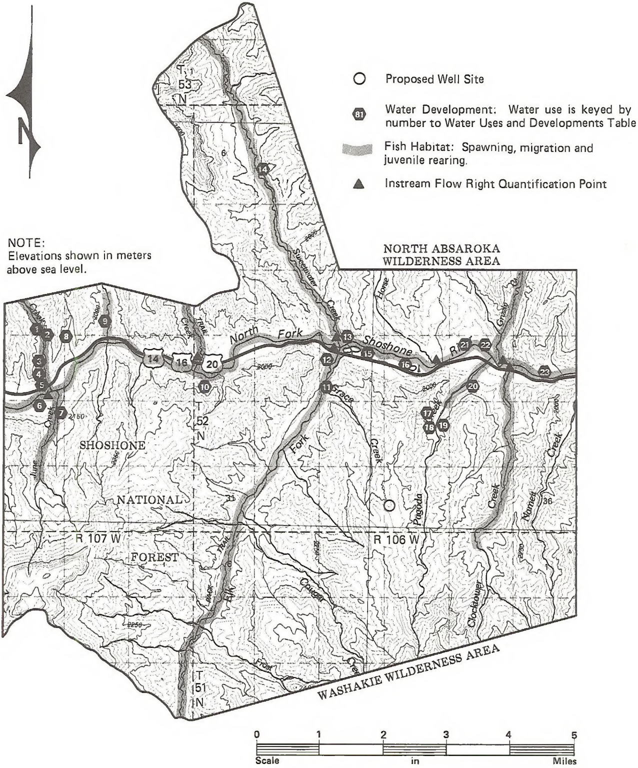
WATER RESOURCES

Surface Water

No perennial streams, wetlands, or developed water uses are near the proposed site, which lies on the ridgetop between Pagoda Creek and Elk Fork. The staging area for helicopter access in Alternative 1, on a colluvial fan adjacent to Clocktower Creek, is out of the scoured floodway and extended floodplain. The access road to the exploration well site in Alternative 2 would traverse about 1 mile of riparian/floodplain in Pagoda Creek and 2.3 miles of dissected mountain slope in the Pagoda Creek drainage. These areas lie within the North Fork of the Shoshone River drainage and encompass about 90 acres of riparian zone and 20 acres of floodway in Pagoda and Clocktower Creek.

The staging are for helicopter access to the Alternative III site is adjacent to Elk Fork Creek about one mile south of the North Fork of the Shoshone River. The access road to the staging area would transverse about one mile of riparian/floodplain and cross Elk Fork Creek. Water from the Elk Fork is diverted at the Elk Fork Ditch for irrigation (Figure 9). This alternative's well site is within 100 yards of Grace Creek.

Water derived from the area is used for a variety of purposes locally and downstream. Buffalo Bill Reservoir, a major storage facility about 16 miles below the confluence of Pagoda Creek and the North Fork of the Shoshone River, is filled by water from this area.



NOTE:
Elevations shown in meters above sea level.

NOTE: Most perennial streams adjacent to roads and trails support recreation uses and aesthetics. All perennial streams support wildlife to some degree.

Figure 9
WATER USES AND DEVELOPMENTS
North Fork Well Environmental Impact Statement

All perennial streams in the area have been designated Class II water quality by the Wyoming Department of Environmental Quality (DEQ), and all of them support, or have the potential to support, game fish. The Absaroka volcanic parent material is easily weathered resulting in steep first and second order channels (see Glossary, "stream order"). The stability of the channels is primarily controlled by the erosional resistance of the bedrock. Third order and some fourth order streams (those formed by merging of smaller streams) are also deeply incised but have lower gradients with considerable deposition of alluvial material. Bar formation is advanced, and some terracing is evident. The bed load is composed of a large range of material sizes and is highly mobile, with considerable accumulation of organic debris. Clocktower Creek has a relatively wide, braided floodway, while Pagoda Creek is fairly confined. Both streams have floodways that are congruent with the toes of colluvial sideslopes, steep rock faces, or tributary alluvial fans.

Steep-sided rocky slopes perched directly above perennial or intermittent streams have a high natural sediment delivery ratio with a large portion of the eroded materials introduced into the stream system.

Water within or adjacent to the study area is used for cold water fisheries, stream aesthetics, recreation, irrigation, wildlife use, and domestic supply. The domestic use is for two lodges, three summer home groups, one recreation residence, six picnic/campgrounds, and one Forest Service administrative site. Figure 9 and Table 3 identify the known perennial water courses and the water uses and developments within the study area.

The North Fork of the Shoshone River leaves the National Forest approximately 1.5 miles below the study area. Primary uses of water between that point and Buffalo Bill reservoir are irrigation, fisheries, and livestock watering. Reservoir storage is used for boating, related recreation, and fisheries, but its primary purpose is to supply irrigation water.

TABLE 3

NATIONAL FOREST WATER USE DEVELOPMENTS
(Key to Figure 9)

MAP NO.	NAME OF USE	PURPOSE OF USE	TYPE OF DEVELOPMENT
1	Moss Creek Rec. Res.	Domestic	Well
2	Residence	Domestic	Well
3	Residence	Domestic	Well
4	Residence	Domestic	Well
5	Residence	Domestic	Well
6	Rumsey Ditch	Domestic	Surface Diversion
7	UXU Lodge	Domestic	Spring
8	Keller Rec. Res.	Domestic	Surface Diversion
9	Aspen Rec. Res.	Domestic	4 Springs
10	Clearwater Picnic Area	Domestic	3 Wells
11	Elk Fork Ditch	Irrigation	Surface Diversion
12	Elk Fork Campground	Domestic	2 Wells
13	Wapiti Campground	Domestic	Well
14	Sweetwater Lodge	Domestic	Surface Diversion
15	Wapiti Admin. Site	Domestic	Well
16	Big Game Campground	Domestic	3 Wells
17	Pagoda Creek Rec. Res.	Domestic	2 Wells
18	Pagoda Creek Rec. Res.	Domestic	4 Surface Diversions
19	Pagoda Creek Rec. Res.	Domestic	2 Wells
20	Pagoda Creek Rec. Res.	Domestic	Well
21	Horse Creek Picnic Area	Domestic	Well
22	Horse Creek Picnic Area	Domestic	Well
23	Hanging Rock Campground	Domestic	Well

Water rights have recently been adjudicated for most of the Shoshone National Forest. Included are the wells and surface diversions for summer homes, lodges, campgrounds, picnic grounds, pasture irrigation, and an administrative site. All these rights have been obtained in the name of the United States in defined quantities for the purposes listed. The adjudication (Bighorn Adjudication, Civil No. 4993, 1983) granted minimum instream flow rights at seven quantification points within the study area. These are shown in Figure 9. These rights were granted for the express purpose of maintaining favorable conditions of flow entitled by the Organic Act of 1879.

Appendix G summarizes additional information for the Pagoda Creek Watershed.

Groundwater

Hydrogeologic information about the study area is either unknown or very general, especially for deeper aquifers. However, all geologic units under the area can potentially contain groundwater, with yields and quality of varying degrees, depending on the lithology of the formation. The only aquifers known to be extensively used are classified as unconsolidated floodplain and terrace deposits next to the North Fork of the Shoshone River. Twenty-three wells extract water for domestic use from these aquifers at depths of 20 to 50 feet, with a yield ranging from 10 to 20 gallons per minute.

Other geologic units and expected hydrologic properties that may be encountered by drilling the North Fork Well are summarized below.

> The Wapiti Formation (volcanics) consists of andesitic breccia, lava flows, and volcanic sandstone, siltstones, and conglomerates undivided. It essentially overlies the entire study area, and it is estimated to extend to a depth of about 1,900 feet at the proposed well site. Water-bearing properties vary considerably, but yields may vary from 5 to 30 gallons per minute (gpm) in sandstone layers. The water quality is probably marginally suitable for human consumption and suitable for livestock and wildlife.
>
> The Cloverly, Morrison, Sundance, Gypsum Springs and Chugwater formations consist of bentonitic mudstones, sandstones, siltstones, limestones and shales. Sandstones in the Cloverly, Morrison, and Sundance formations are usually a reliable source of water. However, potentially large yields may be encountered in solution openings of the Gypsum Springs Formation. Water from rocks in these formations is usually suitable for livestock and wildlife consumption. Water from the Gypsum Spring Formation may be highly mineralized and therefore may not be suitable for consumption.
>
> The Phosphoria Formation consists of siliceous limestone and dolomite, nodular chert, and tan and grey shale. Yields are moderate and water quality is highly variable, depending on location.
>
> The Tensleep Sandstone consists of massive sandstones, grading downward into sandy limestone. The Madison Formation consists of massive limestone. Both formations, but especially the Madison, can develop secondary porosity characteristics in some areas, which can create potentially large yielding wells. Water from the Madison Formation is suitable for human consumption.

WETLANDS AND FLOODPLAINS

Wetlands in the area consist of the riparian/aquatic environment of perennial streams. Such wetlands recharge surface water flows, regulate flood flows, and filter sediments or other potential pollutants from slope runoff. Additionally, riparian vegetation provides a root matrix that stabilizes soils adjacent to the stream and mountain stream bank configurations (Amer. Water Rscs. Assn., 1979). The riverine wetlands channel area provides the vehicle for transporting water and serves as the habitat for fish and other aquatic organisms. The stability, configuration, and composition of the channel determine the condition and extent of the riparian zone and fish habitat.

During runoff, the streamside riparian areas are moisture saturated. This results in large amounts of overland flow, which continues into July in many small channels. The filtering capability of the streamside zone becomes effective as the overland and small channel flows recede.

Wetland soils and vegetation improve water quality in adjacent streams by trapping and cycling nutrients, buffering temperature changes, and providing sites for sediment retention. For example, stream-related wetlands capture 10 to 20 percent of suspended sediment loads when over-bank flows occur (Amer. Water Rscs. Assn., 1979). Streamside wetlands also inhibit downstream flooding by providing temporary water storage and by slowing stream velocities.

The riparian zones, shown in Figure 10, represent the extent of the area that would be inundated or affected by a 100-year recurrence interval flood. (There is a 1 percent chance of this occurring in any given year.) Within this area, the annual peak floodway has also been identified and mapped. Floodway widths approach 700 feet where channels are braided. Generally, floodway size in the area fluctuates according to stream gradient and drainage area. Figure 10 shows the combined wetland and floodway zones in the study area.

AIR QUALITY

The study area is in a Class II air quality area; however, both the north and south boundaries of the study area border Class I areas (North Absaroka and Washakie Wilderness Areas). Yellowstone National Park, 20 miles west, also ia a Class I area. Winds come predominantly from the west and northwest.

The air quality in the study area is excellent because of its closeness to the wilderness areas and because there are no activities that cause air pollution. Human-caused pollution originates from auto traffic, campgrounds, and lodges.

Visibility within the area is sharp and distinct; therefore, the clarity of the air is presumed to be excellent (USDA FS 1981).

NOISE

The existing ambient sound level in the study area is highest along U. S. Highway 14-16-20. The noise, which is caused by traffic, ranges from 55 to 90 dBA. The lower level is from cars 100 feet away; the upper level is from diesel trucks at 25 feet. Farther from the highway corridor, in the more remote areas, the noise level is very low—10 to 40 dBA. These areas have few or no human-caused sounds. The noise level in these remote areas is slightly higher near recreation sites and lodges from increased human activity.

WILDLIFE

Terrestrial Wildlife

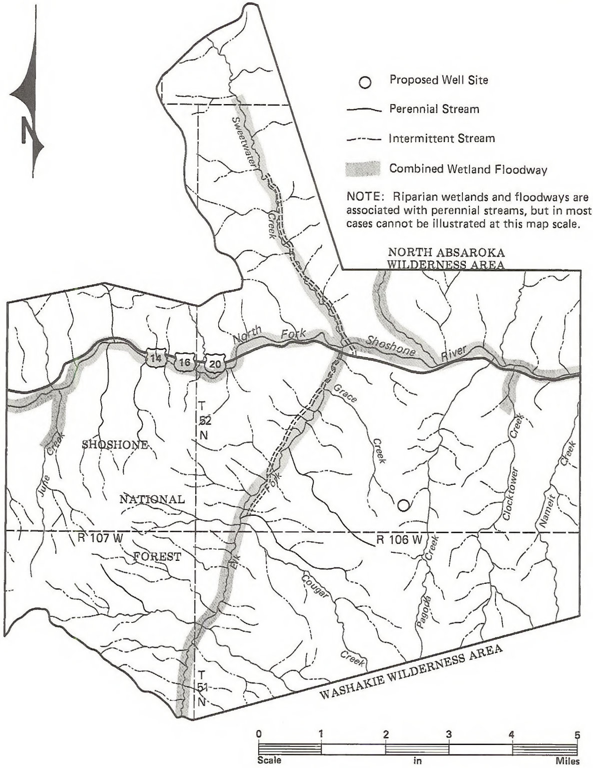
The study area contains a wide variety of terrestrial wildlife species. A species list from the Shoshone National Forest is available at the Forest Supervisor's office in Cody.

The wildlife analysis in this EIS concentrates on four terrestrial species of particular importance in this area: mule deer, bighorn sheep, moose, and elk. These big game species are the major influent mammals in this area, and are the most likely to be affected by oil and gas development. Table 4 shows the big game species and herd units involved, the Wyoming Game and Fish Department population objectives for those herd units, and the current estimated population levels. Distribution maps of these big game populations are shown in Figures 11, 12, and 13. The entire North Fork Corridor is yearlong moose habitat (Figure 14). Other species were considered but are not discussed because the management of these species received less emphasis.

The primary limiting factor on populations of these species in the Shoshone National Forest is the amount of available winter forage. Significant numbers of big game can be found on their respective winter ranges from December 15 to mid-June. Many of the same areas are occupied for birthing from May 1 to mid-June. Snow accumulations from January through March prevent animals from using all but small portions of wintering areas. Snow accumulations also keep these animals from occupying their summer range until mid-June. Bighorn sheep, moose, and elk use currently meets or exceeds proper forage utilization standards to maintain site productivity. Therefore, these small winter areas are crucial to the survival of the populations, and any loss of habitat within them reduces the ability of the area to support existing or desired populations.

According to the Wyoming Game and Fish Department, stress is another limiting factor on big game populations. The greatest stress on big game in this area occurs during winter range occupancy, during the final weeks of pregnancy, and during and immediately after the birthing period (May 15 to June 20). Displacement caused by disturbance or harassment and other stress-induced mortality such as predation, disease, excessive energy expenditure, is not thought to be a major limiting factor at present on elk, deer, and moose in the study area. Some bighorn sheep in the study area are infested with scabies.

Poaching claims a small portion of the deer, elk, and moose herds annually. Poaching and crippling loss of male bighorn sheep is considered significant (Wyoming Game and Fish Department, 1983, Cody Office). Estimated mortality caused by vehicle accidents on the Yellowstone Highway is 15-20 elk, 50 deer, 2 or 3 moose and 1 or 2



NOTE: Riparian wetlands and floodways are associated with perennial streams, but in most cases cannot be illustrated at this map scale.

Figure 10
WETLANDS, FLOODWAYS, and STREAMS
North Fork Well Environmental Impact Statement

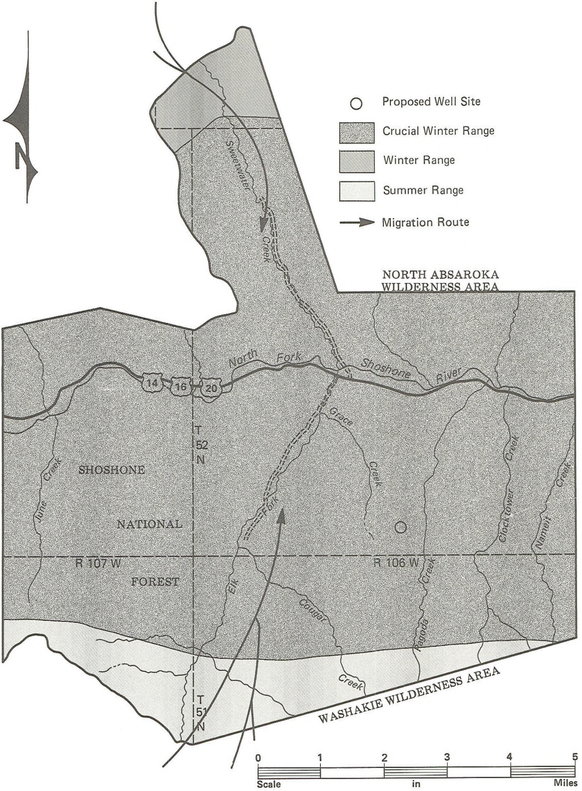


Figure 11
WILDLIFE – ELK
North Fork Well Environmental Impact Statement

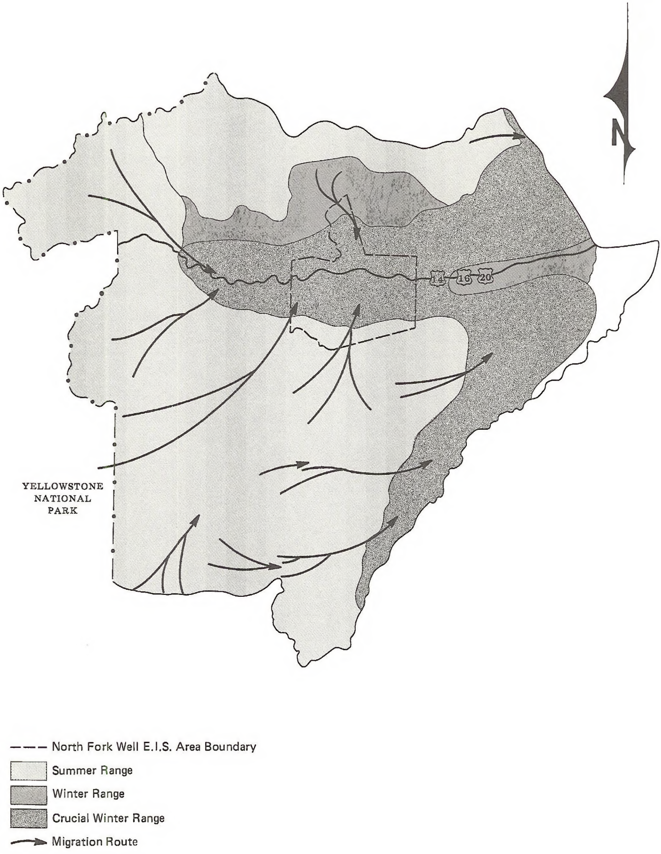

N
YELLOWSTONE NATIONAL PARK
14
16
20
– – – North Fork Well E.I.S. Area Boundary
Summer Range
Winter Range
Crucial Winter Range
Migration Route

Figure 11A
ELK – NORTH FORK SHOSHONE HERD UNIT
North Fork Well Environmental Impact Statement
*Source: Wyoming Game and Fish Department, 12-14-84

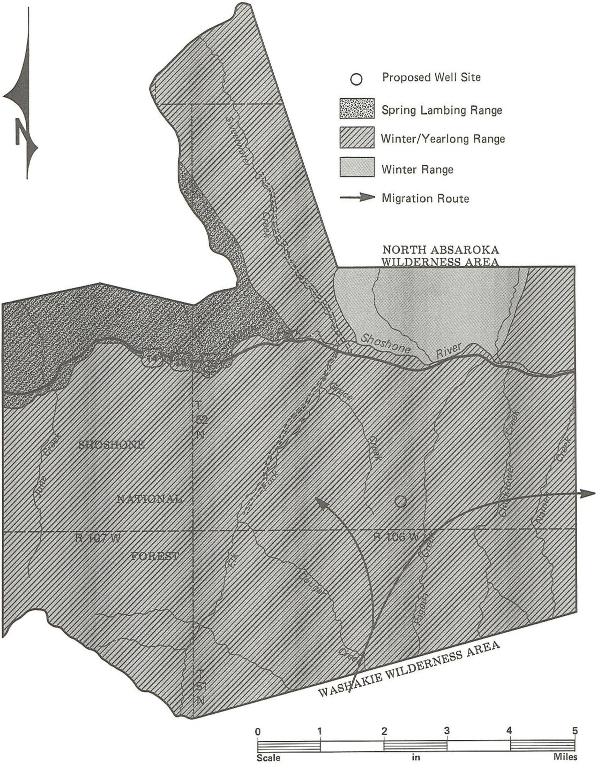


Figure 12
WILDLIFE – BIGHORN SHEEP
North Fork Well Environmental Impact Statement

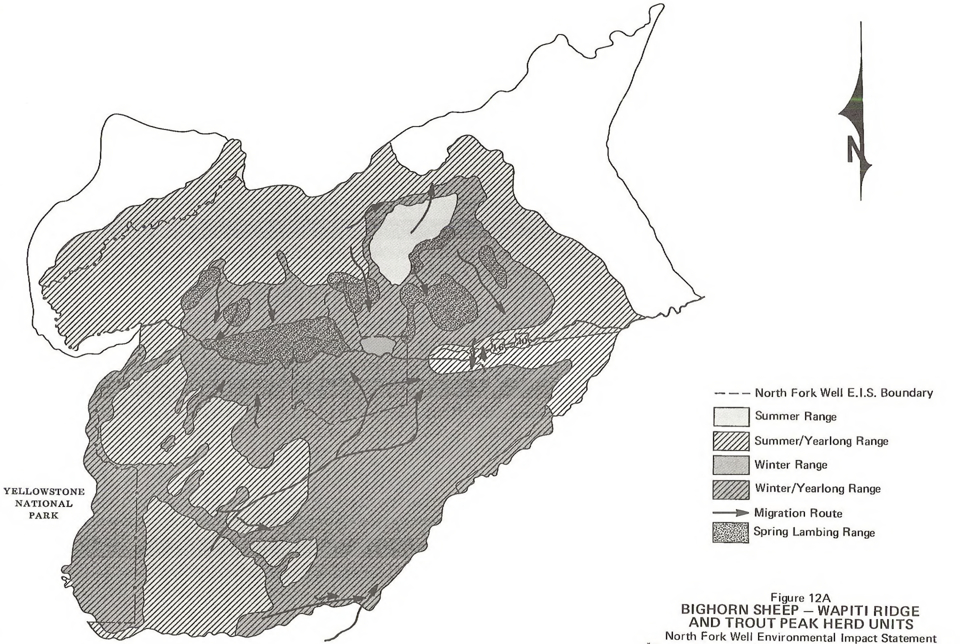


Figure 12A
BIGHORN SHEEP — WAPITI RIDGE AND TROUT PEAK HERD UNITS
North Fork Well Environmental Impact Statement
*Source: Wyoming Game and Fish Department, 12-14-84

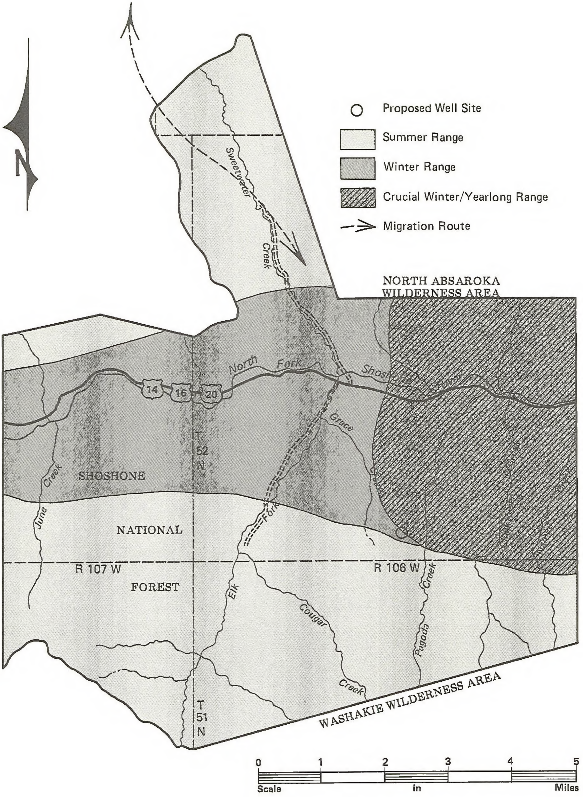


Figure 13
WILDLIFE – MULE DEER
North Fork Well Environmental Impact Statement

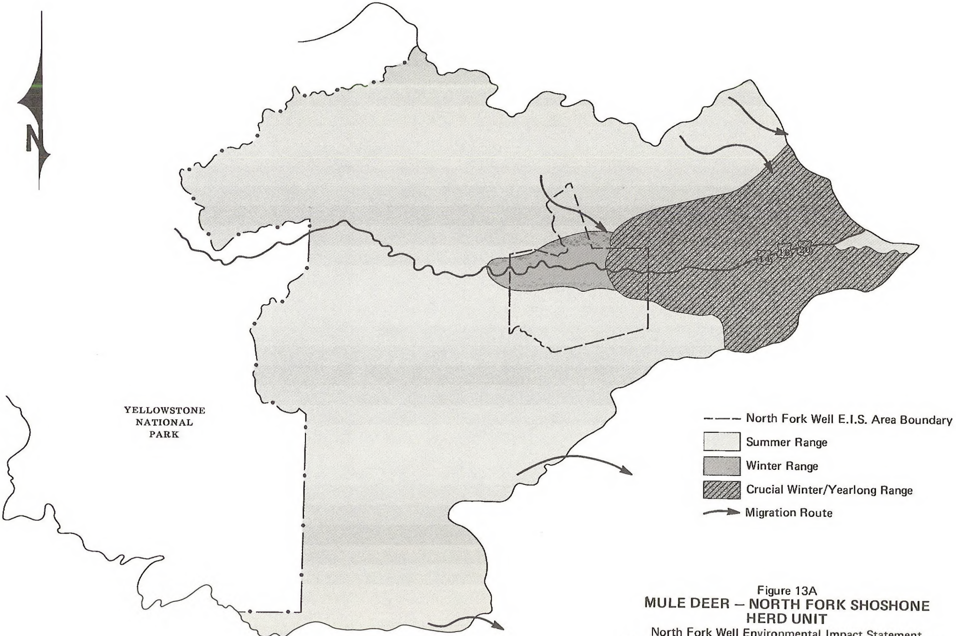


Figure 13A
MULE DEER – NORTH FORK SHOSHONE HERD UNIT
North Fork Well Environmental Impact Statement
*Source: Wyoming Game and Fish Department, 12-14-84

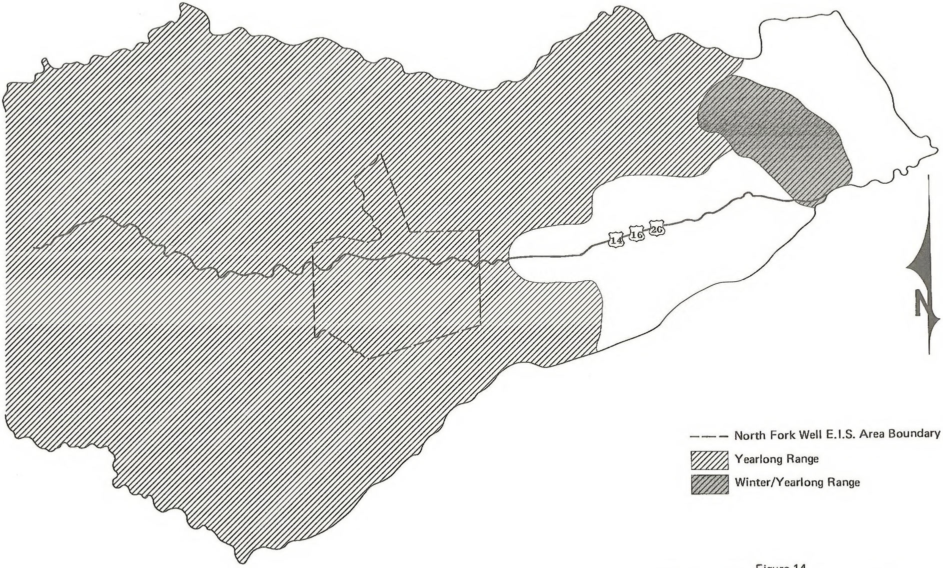


Figure 14
MOOSE – NORTH FORK SHOSHONE HERD UNIT
North Fork Well Environmental Impact Statement
*Source: Wyoming Game and Fish Department, 12-14-84

TABLE 4

BIG GAME HERD UNITS POTENTIALLY AFFECTED BY THE NORTH FORK WELL PROPOSAL

		Seasonal Habitat in the Herd Unit					
Species	Herd Unit	Summer, Transitional, or Yearlong Range (Acres)	Winter Range (Acres)	Crucial Winter Range (Acres)	Total Occupied Habitat (Acres)	Posthunt 1983 Population[1]	Population Objective[2]
Mule Deer	North Fork Shoshone	421,100	13,400	87,700	522,200	1,200	2,500
Bighorn Sheep	Wapiti Ridge	353,900	141,900	141,900	495,800	875	875
	Trout Peak	186,200	20,400	90,500	297,100	440	440
Moose	North Fork Shoshone	503,700	20,500	20,500	503,700	75	75
Elk	North Fork Shoshone	467,900	38,200	186,800	692,900	1,700	1,800

NOTE: Big Game herd units do not correspond to the Study area. Where a distinction was not made between general winter range and crucial winter range, the two were considered the same. Acreages are based on the Wyoming Game and Fish Department herd unit records. Some seasonal ranges overlap. Appendix D shows the economic value to the State of Wyoming that the Wyoming Game and Fish Department places on big game species.

[1] From Wyoming Game and Fish Department Job Completion Reports, 1983.

[2] Program Evaluation Report, Wyoming Game and Fish Department, September 1983. Population objective refers to the quantified target at which the Wyoming Game and Fish Department has committed to the public, after appropriate hearings, to manage a specific wildlife population.

bighorn sheep annually.

Appendix D indicates the economic value to the State of Wyoming that the Wyoming Game and Fish Department places on big game species.

Fisheries

Several species and one subspecies of trout are established as self-reproducing populations in the North Fork Shoshone River drainage. There are also significant resident fish populations in tributaries of the North Fork, and large numbers of fish make spawning migrations from Buffalo Bill Reservoir upstream beyond the study area. The North Fork and its tributaries also contain whitefish and some nongame fish species.

The North Fork of the Shoshone River provides about 11 miles of habitat for migrating adult and juvenile fish reared within the study area. An additional 64 miles of stream provides potential habitat for resident trout. Habitat for spawning, incubation, and rearing of migratory fish lies in about 25 miles of streams that are tributaries of the North Fork. This habitat is critical to the Yellowstone cutthroat and rainbow trout populations that migrate out of the Buffalo Bill Reservoir. Especially large numbers of spawners are found in Moss and Elk Fork creeks, but nearly all the tributaries are significant in providing such habitat.

Many tributary streams provide suitable conditions for trout, but a precise evaluation of substrate character, resident spawning areas, and streamflows has not been made.

Rainbow and cutthroat trout represent more than 95 percent of the total trout numbers within sampled tributaries in the study area. The game fish population is the basis for fishing on the North Fork, some of its tributaries, and Buffalo Bill Reservoir. In 1971, the reservoir provided an estimated 25,000 fishing recreation visitor days.

Both Pagoda Creek and Grace Creek are Class III streams according to the 1978 Wyoming Stream Evaluation. However, recent Wyoming Game and Fish Department surveys show that only about the lower mile of Pagoda Creek has a fishery resource that would be characterized as value Class III, and no substantial fishery was found in Grace Creek.

Threatened or Endangered Species

Federally listed endangered species that could occur in the study area are the peregrine falcon and the gray wolf. The threatened grizzly bear is known to inhabit the study area and bald eagles occur seasonally.

Bald eagles use the North Fork of the Shoshone River occasionally during migration, and a few individual eagles have been observed during winter (Figure 15). At least two eagles were observed in the winter of 1983-84 along the North Fork between Wapiti Ranger Station and the eastern boundary of the Shoshone National Forest. Most past eagle observations along the North Fork have also been in this area (Boyle, 1984). There is no known documentation of bald eagles nesting in the study area.

Although peregrine falcons have been seen within other areas of the Shoshone National Forest, there have been no documented sightings within the study area. Habitat conditions are thought to be marginal in the area for both feeding and nesting.

There has been no documented evidence of the gray wolf occurring in the area in recent years. Habitat components (prey species) are present in significant numbers primarily during the winter and spring. The wolf recovery plan has identified the Yellowstone ecosystem as having a high potential for recovery through a reintroduction program. However, any such program would be instituted only if a feasibility study clearly indicated that a successful reestablishment would cause minimal conflict with existing land uses.

The grizzly bear uses the study area, particularly during May and June following hibernation, when the bears search for carrion, or weakened and newborn animals on big game winter and spring ranges (Figure 15). Early green-up areas (including stream bottoms and old burns) that provide succulent vegetation are also used during the late spring.

Most of the area that could be affected by any alternative currently lies within situation 5 as identified in "Guidelines for Management Involving Grizzly bears in the Greater Yellowstone Area" (Nat. For. and Nat. Pks.; 1979). In accordance with the guidance in this document, maintenance of suitable and available, but unoccupied, habitat is a management option.

Recent information from the Interagency Grizzly Bear Study Team suggests that the lower Elk Fork drainage may be more important to grizzly bears than earlier data indicated. This data indicates that an upgrading of the situation 5 designation may be appropriate. At least 15 grizzly bear sightings and sign observations were documented in the lower Elk Fork drainage between 1981 and 1984. Six of these observations were of female bears with cubs. An adult grizzly was seen killing an old cow elk near the Forest Service Elk Fork Campground in the spring of 1984. At least four radio-collared grizzly bears have been observed in the study area one or more times between 1981 and 1983. A female grizzly bear was trapped near June Creek in the spring of 1984, and she and three cubs spent the summer of 1984 on Sheep Mesa in the Western portion of the study area.

There are no documented grizzly bear dens in the study area; however, there is some indication that at least two bears, both radio-collared animals, denned in the Elk Fork and Sweetwater Creek drainages during the winters of 1980-81 and 1981-82. They were observed immediately before or after denning. The North Fork drainage is experiencing greater bear activity than in the recent past. This may indicate a change in bear activity centers from inside Yellowstone Park to areas outside the park, including the North Fork drainage.

According to the USFS, "Based on the foregoing observation, the Forest Service has analyzed, and will manage this area for the purposes of this project, as though it were Management Situation 2. Population and habitat conditions for a Management Situation 2 area are: The area lacks distinct grizzly population centers; highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present occasionally. By definition, Management Situation 2 areas are those considered unnecessary for survival and recovery of the species, although the status of such area is subject to review and change according to demonstrated grizzly population and habitat needs. Major activities or programs may affect the conservation and recovery of grizzly bears primarily in that they may contribute towards human-caused bear mortalities. Management direction in such areas recognizes the grizzly bear as an important but not the primary use on the area. Habitat maintenance and improvement may be, in some cases, an important management consideration. Management will at least maintain those habitat conditions which resulted in the area being stratified as Management Situation 2. Minimization of grizzly-human conflict potential that could lead to human-caused mortalities is a high management priority. Demonstrated grizzly populations and/or grizzly habitat use will be

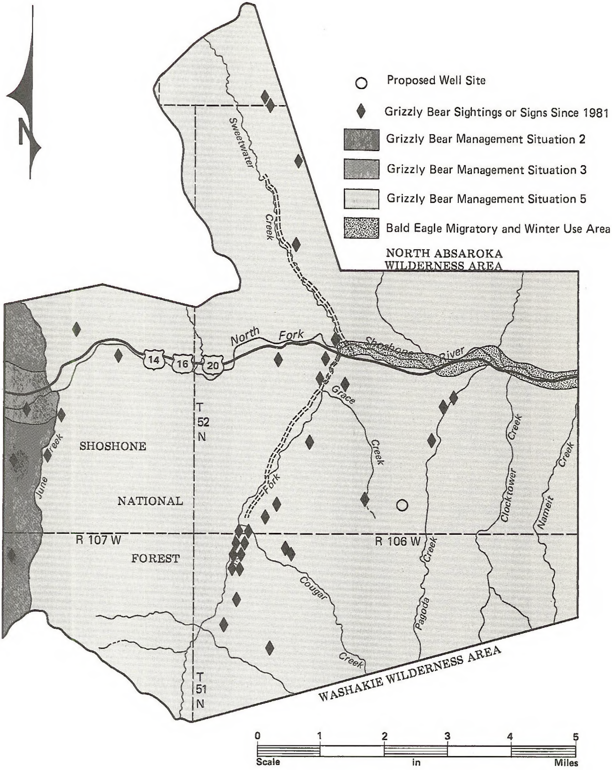


Figure 15
THREATENED AND ENDANGERED SPECIES
North Fork Well Environmental Impact Statement

accommodated in other land use activities if feasible, but not to the extent of exclusion of other use needs. A feasible accommodation is one which is compatible with the major goals and/or objectives of other uses. When grizzly population and/or grizzly habitat needs are mutually exclusive, the other land use needs may prevail in management considerations. If grizzly population and/or habitat use represents demonstrated needs that are so great (necessary to the normal needs or survival of the species or a segment of its population) that they should always prevail in management considerations, the area should be reclassified under Management Situation 1. Nuisance grizzlies will be controlled."

VISUAL RESOURCES

The study area encompasses the rugged Absaroka Mountains. Terrain is varied and destructive, with talus slopes, rocky cliffs, avalanche chuts, sharply serrated ridges, and highly eroded mountains faces interlaced with hanging valleys and flat-topped buttes. Vegetation includes pine, spruce, fir, and aspen with riparian vegetation along the stream drainages. Open grass-covered slopes and barren cliffs are common. Waterfalls, cascading rapids, and placid pools are within some of the stream courses.

Almost 90 percent of the landscape in the study area remains virtually untouched by human activity. The U. S. Highway 14-16-20 travel corridor, which makes up the remaining 10 percent, has been modified by roads, vegetative manipulation projects, recreation developments, and forest administration sites. These activities are visually evident, but they are subordinate to the natural landscape and create only a minor disturbance in the natural setting.

The Forest Service visual resource management system establishes visual resource management goals by evaluating landscapes in terms of four factors—variety class, visual absorption capability, distance zone, and sensitivity level. Lands are assigned to one of four visual quality objective classifications on the basis of these factors. The classifications are Retention, Partial Retention, Modification, and Maximum Modification. The Retention objective allows only management activities that are not visually evident. The three remaining objective classes are progressively more permissive.

Variety classes arrange the landscape into relative degrees of uniqueness. This determines the landscapes that are most important and those that are of lesser value from the standpoint of scenic quality. "Distinctive" variety classes (landscapes having unusual or outstanding visual quality) compose 20 percent of the study area; "common" variety classes (landscapes that tend to be common throughout the region) make up the remaining 80 percent.

Visual absorption capability is a measurement of the landscape potential to accept visual alterations without a significant loss of natural landscape character. It considers slope, soil colors, regeneration potential, slope stability, accelerated erosion potential and screening potential. Within the study area, 10 percent has a "high" visual absorption capability, 7 percent has a "moderate" visual absorption capability, and 83 percent has a "low visual absorption capability.

Distance zones indicate how a landscape is viewed from travel routes and use areas, while sensitivity levels classify travel routes and use areas to determine public concern for scenic quality. The U. S. Highway 14-16-20 and FDR 423 travel corridors and associated use areas are classified as sensitivity level one, indicating a high use concern for scenic quality.

Combining these factors to establish visual resource management goals has resulted in 20 percent of the study area lands being assigned to the "Retention" class, 30 percent to "Partial Retention," and 50 percent to "Modification." Most of the "Retention" class lands are in a corridor along U. S. Highway 14-16-20. The "Partial Retention" lands are mostly north of the highway, with some addition area in the lower reaches of the Clocktower, Pagoda, and Elk Fork drainages. The lands with visual management objective allowing "Modification" are concentrated in a large block in the southern half of the study area.

OUTDOOR RECREATION

Table 5 displays the estimated recreation use for the North Fork Study Area. Approximately 80 percent of this use occurs along the North Fork travel corridor. Eleven developed public recreation sites within the study area account for about 50 percent of the total recreation use. Most use of these sites occurs between June 15 and September 1. Eight privately developed recreation sites (resorts, lodges, summer homes, and residences) account for about 30 percent of the total recreation use (Figure 16)

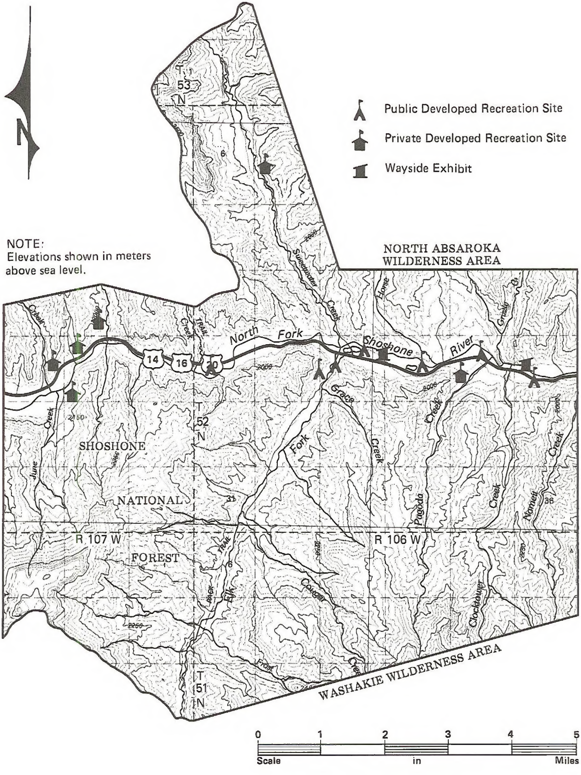


Figure 16
DEVELOPED RECREATION SITES
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TABLE 5

ESTIMATED ANNUAL DISPERSED OUTDOOR RECREATION USE (Recreation Visitor Days)

Visitor Days of	North Fork Study Area
Sightseeing	133,500
Dispersed Camping	8,000
Hunting	6,400
Horseback Riding	6,400
Fishing	4,800
Hiking	800
River Floating	160
TOTAL	**160,060**

NOTE: A majority of the dispersed use is from driving and viewing scenery from U.S. Highway 14-16-20. Approximately 80 percent of this use occurs from June 15 to September 1. Most of the remaining use occurs during the big game hunting season in October and November.

Recreation settings within the study area are categorized as Rural, Roaded Natural, Semiprimitive Motorized, and Semiprimitive Nonmotorized. These categories are based on evidence of human activities, amount of recreation use, and amount of regulation and control imposed through management actions.

Rural areas in the study area occur along the U. S. Highway 14-16-20 travel corridor and are characterized by substantial sights and sounds of human activity. Facilities are present for use by people for intensive motorized use. While only 9 percent of the study area is considered rural, most of the recreation use occurs here.

Roaded Natural areas in the study area occur up the Sweetwater drainage, along minor drainages where summer homes and resorts are located, and along the perimeter of all Rural recreation settings. These areas are characterized by moderately evident sights and sounds of human activity; some facilities for motorized use are present. Approximately 13 percent of the study area provides this recreation setting.

Semiprimitive Motorized settings are provided along a narrow corridor up the Elk Fork drainage. This setting is available except during the winter when the area is used by wintering wildlife and is closed to motorized use. Semiprimitive motorized settings occur on approximately 4 percent of the area.

Semiprimitive Nonmotorized settings are present in the rest of the study area. Although these areas are open to certain types of motorized vehicles, terrain prevents their use. Approximately 75 percent of the study area is within the semiprimitive nonmotorized setting zone.

WILDERNESS

Background

The study area is bordered on the north by the North Absaroka Wilderness and on the south by the Washakie Wilderness. The study area contained portions of two RARE II areas, 02045—Wapiti Valley North and 02048—Wapiti Valley South (Figure 17). The North Fork Well site was a RARE II area. RARE II is the Forest Service's Roadless Area Review Evaluation Program. RARE II area 02048 comprised 24,620 acres that was studied for possible addition to the Washakie Wilderness. RARE II area 02045, encompasses 9,795 acres in the study area. It was considered for possible addition to the North Absaroka Wilderness.

The Wyoming Wilderness Act of 1984 addressed the management of portions of the Study Area as RARE II areas. The congressional action released these two RARE II areas for multiple use management including grazing, recreation, snowmobiling, wildlife protection, as well as possible mineral exploration and development. The bill also directs the Forest Service that the released lands "need not" be managed to protect their suitability for wilderness designation during the implementation and life of a forest plan.

CULTURAL RESOURCES

The North Fork Well site and road access corridor is in an area used by Indians and early trappers. This area, bordered by the Big Horn Basin on the east and northeast, has been used by humans for more than 12,000 years. The influence of the Big Horn Basin may have spilled over into the area.

No known cultural resources have been discovered on the proposed well site. There is a

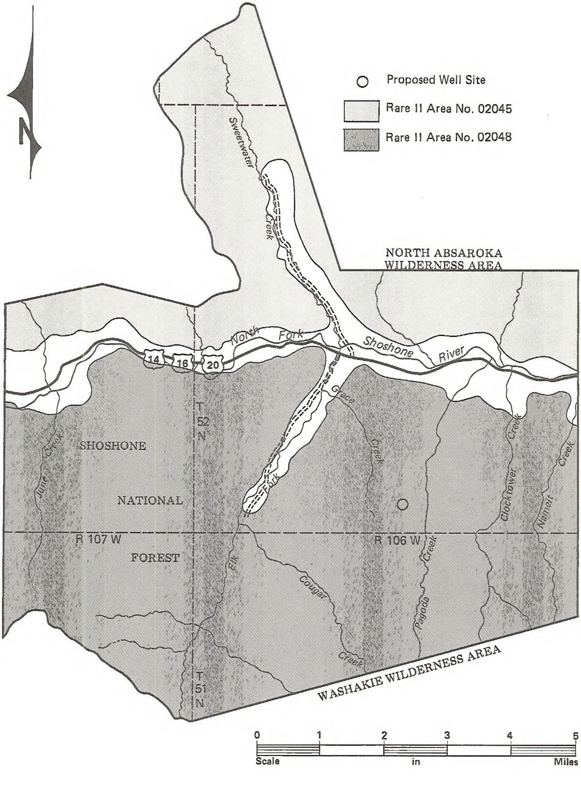

Figure 17

RARE II MAP

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historical site (48PA830) nearby, but it is not considered eligible for the National Register of Historic Places.

Known cultural resources within the study area are the Wapiti Ranger Station and the Mummy Cave. Both are currently listed in the National Register. Five more sites have been recorded with the State Historic Preservation Office: Site 48PA830, discontinuous stone alignment; 48PA328, lithic scatters; 48PA828, lithic material; 48PA829, bone fragments and fire hearth; and 48PA325, open camp. Site number 48PA829 is considered eligible for inclusion in the National Register of Historic Places.

The possibility of additional cultural resource sites exists. Significant properties are most likely to occur on relatively flat ground (0 to 15 percent slope), along major streams and their tributaries such as the North Fork of the Shoshone River, and along foothill transition vegetation zones.

LANDS AND SPECIAL USES

There are three nonrecreation special uses under permit—two water transmission facilities and a power transmission facility.

Recreation special uses under permit in the study area are the Pagoda Creek, Aspen Creek, and Moss Creek summer home groups; the Keller recreation residence; the UXU Lodge; and Brannon's Wilderness Resort. Two lodges, Bill Cody's Ranch Inn and the Blackwater Lodge, are adjacent to the study area. Some day horseback trips from these lodges enter the study area. There are no outfitter guide base camps in the study area.

On August 16, 1983, Marathon Oil Company submitted an application for the designation of a logical unit area that closely corresponds to the Study Area (Figure 18). Unitization is the pooling of leasehold and other rights within a given area and sharing of the risks of exploration and development and returns. Unitization requires drilling activity for the orderly development of petroleum reserves. If and when the unit agreement is approved, Marathon would have six months in which to begin the well. Unitization for the North Fork area would designate Marathon as the unit operator. Unitization usually minimizes drilling activities if field development occurs, and it would allow the management agency to better manage operations.

Lands within the study area have been leased for oil and gas development under the Mineral Lands Leasing Act of 1920. The Secretary of the Interior is authorized to issue such leases. In exercising this authority the BLM consulted with the USFS on protection of surface values and obtained the Forest Service's recommendation as to which lands should be leased for oil and gas.

The Forest Service made this recommendation after preparing an Environmental Assessment (EA) in 1979. This Environmental assessment described three alternatives for Forest Service responses to Bureau of Land Management proposals to issue oil and gas leases for National Forest System lands in the Rocky Mountain Region. "No action" was one of the alternatives described. Estimated effects of implementing each of the alternatives are discussed. The Forest Service preferred alternative was to recommend lease issuance with appropriate stipulation for the management and protection of surface resource values. Case-specific environmental analyses were required for those situations where recommendations against or denial of consent to lease issuance by the Bureau of Land Management must be considered. The EA was not itself a decision document, but the BLM then based its decision about whether or not to lease primarily on the USFS recommendation. The decision to issue an oil and gas lease is discretionary, but a decision not to issue a lease must be based on substantial, reasonable, and supportable factors. Lands administered by the USFS are generally managed under multiple-use guidelines.

Leases within the study area were issued by the BLM between August 1980 and May 1984 (Figure 18). Since the leases are in an area not proven to contain an oil and gas deposit, the leases were issued noncompetitively. Since the lands within the study area had never been leased before they were available for leasing to every eligible citizen, the applicant submitted an offer to lease with a $75 filing fee plus the first year's rental ($1 per acre), and the lease was granted.

TRANSPORTATION

Access to the study area is gained by U.S. Highway 14-16-20, which parallels the North Fork of the Shoshone River. The Wyoming Highway Department maintains this hard-surfaced route from Cody to the east gate of Yellowstone National Park.

The study area contains 15 miles of forest development roads and 21 miles of forest development trails. Roads, which are primarily for

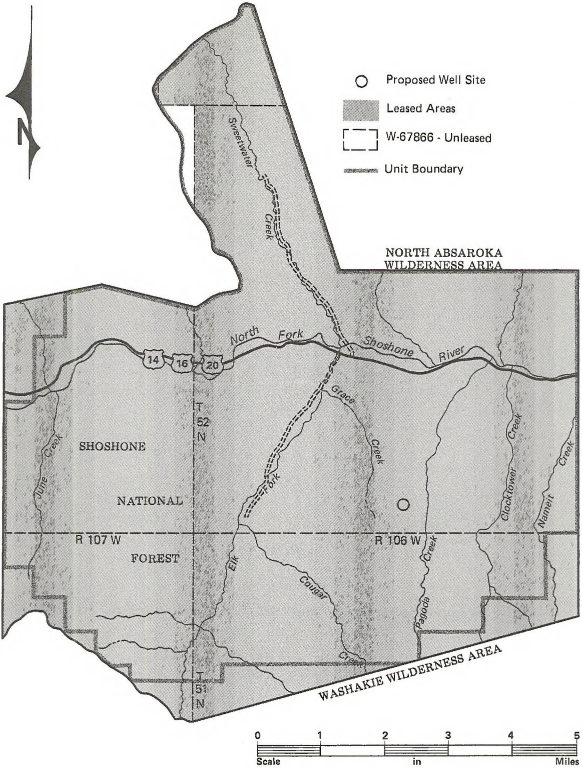

Figure 18
OIL AND GAS LEASES
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recreation, are concentrated within and along the North Fork of the Shoshone River Valley. The exception is the Sweetwater road, which extends 3.5 miles up Sweetwater Creek. Trails are also recreation oriented. Several of the trails provide access to the wilderness areas north and south of the study area. Developed trailhead facilities are available only at Elk Fork.

The study area is closed year-round to all motorized travel off forest roads except for trail vehicles operating on forest trails and snowmobiles operating on snow. Trails 758 and 787 are closed to all motorized travel (Figure 19).

Average daily traffic on U.S. Highway 14-16-20 in 1982 was 958 vehicles. The daily average for 1982 in June, July, and August, the period of the highest use, was 2,846 vehicles.

SOCIOECONOMIC CONDITIONS

Economics

Major Industry

Oil and gas activity in the study area would probably have economic effects throughout Park, Big Horn, Hot Springs, and Washakie counties. In 1980 the services sector (health, education, others) accounted for 19 percent of Big Horn Basin employment, the government sector 17 percent, retail trade 9 percent, lodging-eating-drinking establishments 8 percent, and agriculture 8 percent. The mineral sector, particularly the oil and gas industry, is more dominant in the basin's economy than these employment figures would suggest. In 1980 the basin produced 36 percent of the oil and 5 percent of the gas produced in Wyoming. This production accounted for 77 percent of the region's export income. Taxes on oil and gas property and production are a major source of revenue for state and local government. In Park County, for example, approximately three-fourths of the tax valuation is provided by companies involved in oil and gas production. A severance tax on oil and gas is assessed by the state at a rate of 6 percent of the value of the products extracted. A portion of this revenue is returned to local government. While they do not begin to compete with the mineral sector, the agriculture and tourism industries are also significant sources of regional income.

The recreation use also constitutes a basic industry to the extent that many users are not local residents. For example, elk hunters from Chicago may spend money locally in 1) the trade sector for gasoline, groceries, and similar items, 2) the eat, drink and lodging sector, and in 3) the other services sector for recreation and repair services.

While expenditures directly and indirectly tied to recreation use may be relatively large, recreation type businesses employ few FTEs relative to their dollar volume. Changes in basic employment generally lead to local economic impacts.

Nature of the Oil and Gas Industry

Exploratory drilling usually requires a large capital investment to drill new wells and construct support facilities. This may also require extensive labor. Normally there are 50 to 75 employees on drilling crews throughout the Big Horn Basin.

Some aspect of exploratory drilling may add to the export sector of the local economy, meaning that the wages paid to those employed in this activity come from outside the region and constitute a net flow of dollars into the local economy. This stimulates employment in the secondary sector, that part of the local economy that serves the needs of those employed in the export sector of the economy such as medical and retail services. However, some jobs (such as helicopter crews and pilots) may require job skills from outside the area. It should be noted that these activities do not alleviate existing unemployment even though the number of available jobs increases.

The labor force required for oil and gas exploration demands public services such as water and sanitation facilities, which may increase capital improvements. Taxes assessed against the industry and against the property of the employees may cover the cost of increased services and capital expenditures.

Social Conditions

The population of the Big Horn Basin according to the 1980 census totals 48,741. Two-thirds of the population resides in approximately a dozen small towns scattered throughout the basin. The four largest communities are Cody (population 6,790), Worland (6,391), Powell (5,310), and Thermopolis (3,852).

During the 1970s, population in the basin increased by 20 percent. The population of the state of Wyoming, by way of contrast, grew 41 percent during the same period. The more modest figure prevailing in the Big Horn Basin reflects

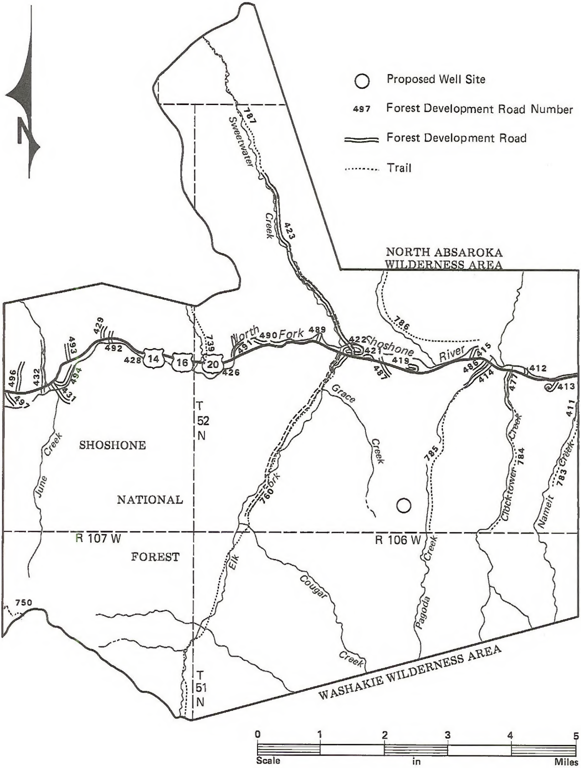

Figure 19
EXISTING TRANSPORTATION SYSTEM
North Fork Well Environmental Impact Statement

the fact that basin communities have not experienced the rapid "boom town" growth that has taken placed in some part of the state.

Park County and Cody have characteristics that affect the area's ability to adapt to potential local population increases. There is extensive exposure to industrialization, particularly to the oil and gas industry. Minority populations are virtually nonexistent. The population levels of Cody and Park County have exhibited gradual increases during the past decade or so. The local labor force is diverse, with many persons involved in the oil and gas industry.

Both the county and Cody appear to be well-positioned with regard to the provision of public services and facilities, and both jurisdictions possess land use planning and control mechanisms. Community leaders have considerable experience in dealing with growth management questions.

Cody is socially diverse, with a mix of occupations, religions, businesses, income levels, and local length-of-residence groups. It appears that certain events have drawn various interests together, although there is some routine fragmentation among residents. Cody is intermediate in terms of formality. It is no longer an isolated homogeneous small town; however, it has not yet developed the impersonalization and bureacratization that larger population centers tend to exhibit. Many residents here relocated from other parts of Wyoming and the rest of the nation.

Given these characteristics, it appears that Cody and Park County have high capacities to absorb additional residents without disruption to the communities or individuals.

Socially, the foremost stress associated with the proposed drilling is residents' ability to reconcile two contrary themes of thought. First, most Cody residents are supportive of the business ethic, believing in broad rights for companies, understanding the reliance of local residents and government on the oil industry, and trusting the marketplace to make efficient decisions.

Second, the North Fork area is highly valued for its aesthetics, its wildlife, and, given its proximity to Cody, its attraction to local residents as a place to recreate without large number of outsiders being present. It is a resource cherished by local residents as well as some visitors from other parts of the country.

The North Fork Well issue has caused many residents to attempt a reconciliation of these two themes. If the well, and possible supportive developments associated with it, such as roads and pipelines, were to be located east of Cody, there would be no local concern and only limited local awareness. Given its location, however, many residents are unable to resolve this dilemma and have mixed sentiments on the proposal. Others have clearly established positions as opponents and proponents. This results in diverse and contradictory messages to local and federal officials trying to figure out prevailing local sentiment. There is no clear consensus and, all things considered, none should be expected.

Finally, it appears that if equipment is moved with helicopters, the proposed exploratory well would present only a minor mental friction for most people. It is the potential for field development throughout the study area that causes hesitation and qualification of support among many Cody residents. Local concern will escalate sharply if commercial quantities of petroleum are discovered and additional exploration production activity is planned.

CHAPTER III

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the environmental consequences, unavoidable adverse impacts, short-term use versus long-term productivity, and any irreversible or irretrievable commitment of resources for each alternative.

The consequences described here are limited to those that are considered significant or controversial. Those resources that would not be affected are not discussed unless it is necessary to provide a basis for analysis or to respond to public concerns. Generally, the impacts associated with drilling a well are considered short-term; however, if the well is developed for production, they would be long-term, that is, they would last at least for the life of the well.

There would be no environmental impacts associated with Alternative IV (no action), however there could be adverse economic impacts to Marathon and the lease holders. The discussion of the affected environment in Chapter II represents the existing environment and what could be expected to continue unless otherwise specified. The "no action" alternative would result in no adverse environmental impacts.

The impacts that would be expected to be associated with drilling a well can be predicted with a fairly high level of confidence. However, the consequences of developing the area for oil or gas production depend on the extent, location, duration, and timing of oil and gas development activities. It is impossible to anticipate if or exactly how the area would be developed; however, area development would occur only if commercial quantities of oil and gas are found during exploratory drilling.

During construction, drilling, and abandonment, the well site will be given an unannounced detailed inspection at least every two weeks by the BLM. In addition to these general inspections, all of the following special operations will be witnessed:

1. The first Blowout Preventer (BOP) pressure test.
2. Running and cementing of all casing strings.
3. Any Drill Stem Tests.
4. Plugging of the well, if dry.
5. Any undesirable event (blowout, fire, spill, etc.)

If any non-compliance is found which threatens the environment or the public health and safety, operations will be ordered immediately shut-in until corrective action is taken. Lesser incidents of non-compliance will result in a written order to correct the violation within a specified time, and possible monetary assessment. Failure to take corrective action after written notice could result in a civil penalty of up to $2,250 per day. The BLM would have lead authority to require all corrective actions. However, where action is required concerning surface use or damages, the USFS would be consulted.

Probable methods of developing and producing oil and gas from Alternatives I, II and III, and the consequences of the assumed production scenarios are beyond the scope of this action; however, a discussion of field development is included in Appendix E to provide a perspective of possible actions and impacts that might result from drilling the well.

ALTERNATIVE I: DRILLING THE NORTH FORK WELL

The effects that would be expected to occur under Alternative I are described by resource in this section. Under Alternative I, the proposed action, the exploratory well would be drilled in Section 34, T52N, R106W. Access would be by helicopter.

Geology and Engineering

The faulting and fracturing of the volcanics and the underlying strata in this area could lead to lost circulation problems. Lost circulation causes a reduction in the hydrostatic head of the drilling mud column (which controls formation pressure).

If appropriate measures are not taken, this reduction in the hydrostatic head of the mud column might cause a blowout. By using air mist gel as a circulating medium the lost circulation problem can be mitigated.

Abnormal formation pressures are not reported in the area, and the study area is outside the identified high pressure area of the Big Horn

Basin, which is subject to Wyoming Oil and Gas Conservation Commission Rule 320A. Rule 320-A details the requirements for blowout prevention equipment when drilling in identified high-pressure zones. The rule also directs the Wyoming Oil and Gas Conservation Commission to identify and map areas of abnormal formation pressures. Hydrogen sulfide gas is always a distinct possibility whenever the Phosphoria Formation is penetrated, and Marathon has submitted a contingency plan to deal with this exigency (see Appendix B).

In a worst case analysis, a "kick" would occur if the formation pressure encountered down hole exceeds the hydrostatic pressure exerted by the drilling fluid in the hole. If all blowout prevention equipment fails then a blowout would occur.

A blowout is the emission of gases, oil and/or water from deep below the ground to the surface. Possible harmful emissions that could cause environmental damage during a blowout include lethal hydrogen sulfide gas, carbon dioxide gas, contaminated formation water; drilling mud, and oil. Contaminated water, drilling mud and oil could be spread over a one mile radius.

Due to the remote location of the North Fork Well, a blowout could continue for several days. Within a week additional blowout control equipment could be helicoptered to the site to control the well.

The water, mud and oil would probably kill vegetation encountered; may permanently impair the productivity of at least some soils; degrade the water quality in Pagoda Creek, Grace Creek, and possibly Elk Fork and North Fork; and degrade or destroy wetlands. Fish and wildlife and their habitat could be destroyed; visual resources would be degraded; and recreation use and special uses would at least be temporarily unavailable and use would probably be permanently reduced. Control efforts could disrupt transportation on the Yellowstone Highway.

Gases would probably degrade the air quality in the Class I air sheds over the Washakie Wilderness and North Absaroka Wilderness until the well is capped. The rugged topography would make cleanup extremely difficult especially on steep side slopes and remote areas. A blowout would capture national interest and cause intense local and regional public reaction. The credibility of the USFS, BLM, and some state agencies would be challenged and the environmental reputation of Marathon Oil Co. would be attacked. The number of tourists heading for Yellowstone National Park could decline and cause noticable economic impacts especially in Cody.

A blowout could cause unpredictable and severe environmental damage, including fires, noise, air pollution, and contamination of the surrounding ground and drainages. However, the likelihood of a blowout is extremely small with the operating practices described in the APD. In the past ten years there have been only two uncontrolled blowouts in Wyoming out of about 12,000 wells that were drilled; and there have been no reported uncontrolled blowouts in the Big Horn Basin out of 1,400 wells that were drilled.

Oil spills during drilling operations are associated with blowouts, so they, too, are extremely rare. Drilling mud spills are also extremely rare during drilling operations. They are almost always the result of reserve pit failure. Proper reserve pit design and construction essentially eliminate this.

Over the past five years only five reserve pits have failed in the Worland District while over 1,000 wells were drilled. In the Cody Resource Area, adjacent to the Shoshone National Forest, no pit failures occurred during the same period. The pit failures were caused by conditions that are mostly not present in the North Fork APD, i.e., this APD specified lining the pits and cutting the entire pit into the ground instead of building the pit in fill material. This essentially eliminates the possibility of the pit breaching if conditions of approval are met. Thus, a spill would only occur if the pit overflows as a result of improper drilling mud management or an uncontrolled flow of formation water. The worst case impacts of drilling mud overflowing the pit are also somewhat unpredictable. The spill would flow east toward Pagoda Creek and would probably kill some vegetation contacted and may permanently impair the productivity of some soils affected. If the spill flows over the ridge it would be difficult to contain or clean up on the steep slopes dropping off toward Pagoda Creek. If the spill reaches Pagoda Creek it could temporarily degrade the water quality in both Pagoda Creek and the North Fork until control of the well bore can be reestablished. This could have unpredictable negative impacts on soil, vegetation, water resources, wetlands, floodplains, fish and wildlife, visual resources, recreation, cultural resources, other special uses, transportation, and social and economic conditions.

There would not be any significant impacts on the geothermal systems in the area. A "worst case impact" could include a change in temperature, pressure, or flow rate in a geothermal system near the proposed well. However, since the proposed

North Fork Well is down slope from Yellowstone National Park, the Park's hydrothermal system would not be affected. Because the well site is 20 miles west of the Cody hydrothermal system, it is also unlikely that there will be any impact in either temperature or flow rate in this system. There have already been several wells drilled east of the North Fork Well which did not cause any known changes in temperature or flow.

High pressures, if encountered while drilling in geothermal areas, would increase the risk of a blowout; but, the blowout prevention equipment that Marathon proposes to use can withstand pressures in excess of 3,000 psi. This is approximately twice the capacity needed to control the highest pressures that might be encountered, based on previous well data, i.e., the final shut in pressure of a well drilled in 1971 approximately 10 miles down-dip of the proposed North Fork site was 1,536 pounds per square inch.

According to the Bureau of Mines, any impact on mineral resources as a result of drilling in the study area probably would be considered minimal and would be outweighed by potential benefits to the mineral industry. (Jinks 1984)

Soils and Vegetation

General

There would be localized soil loss and impairment of soil productivity on about 2.5 acres (USFS 1984).

Pad and water pipeline construction might permanently impair natural soil productivity, especially where soils are shallow and construction requires excavating bedrock. Soil excavation results in temporary disturbance of the original soil profile and rooted vegetation. While stockpiling preserves most soil features, prolonged storage generally decreases soil fertility and vegetation viability. Some soil materials would be lost to stockpile erosion. In disturbed areas, the original soil condition and site potential are often inferior after reclamation.

Natural and accelerated erosion also affect soil productivity. A small absolute difference between natural and accelerated erosion rates would have little effect either on or off the site. Conversely, a low natural rate and a high accelerated erosion rate demonstrates a high impact.

Alternative I would disturb 2.5 acres of mountain slopes and ridgetop soils and would cause an estimated 60 tons of erosion (1.5 times the amount that would occur naturally from those 2.5 acres) before it was reclaimed. No long-term unmitigable impacts would result.

Rare and Unusual Plants

Drilling the North Fork Well would not seriously affect any local (endemic) plant species. In particular, *Lomatium attenuatum* is reasonably, abundant especially on steep slopes, so oil development on the North Fork would be unlikely to deplete its population seriously.

Even though the geographic distribution of *Penstemon absarokensis* appears to be restricted to talus and gravel areas along the North Fork, its situation is not critical enough to preclude drilling of the proposed well. It is conceivable that because this plant lives on rock piles, surface disturbance could create a more suitable habitat for the plant. It also seems unlikely that the North Fork well or other oil and gas developments would seriously affect any of the other species of rare plants in the area that that are described in Appendix C.

Water Resources

Surface Water

Alternative I would not affect the quality or quantity of water flowing in Clocktower Creek nor would it affect wider uses within the study area. (See Appendix G for a watershed summary of Pagoda Creek.) Similarly, neither Pagoda Creek's hydrologic regime nor the wetlands and floodplains within the study area would be affected. Approximately 1.5 tons of sediment per year could be introduced into Pagoda Creek from construction of the water line between Pagoda Creek and the well site (USFS 1984). However, this is only an insignificant increase over natural levels. This potential could be reduced with waterbars and revegetation of disturbed soil.

Groundwater

Regulations regarding cementing of fluid-producing zones and surface casing during drilling greatly diminish the potential for groundwater contamination from interformation mixing of water.

The proposed action contains several measures to protect groundwater quality (Appendix B).

These measures and the distance from North

Fork Shoshone River Valley virtually preclude any contamination of domestic wells.

Air Quality

Drilling would cause only minor air quality impacts unless a gas blowout occurred. Air quality could be affected by exhaust and dust from helicopter support activities, exhaust from drilling rig engines, and gases encountered during drilling and testing.

Noise

Noise levels would increase from existing levels of approximately 30 dBA to an estimated 94 dBA, the measured noise level when a helicopter is directly overhead at 400 feet on landing approach. Takeoff would be quieter than approach during flyover at 125 knots at 500 foot altitude; in that case the noise level on the ground 500 feet to the side of the flight path (average of right and left side) would be about 80 dBA. The helicopter would be expected to make about 910 trips and have a total flight time of approximately 162 hours. See Figure 4 for the proposed flight path.

The average weighted noise levels from a representative drill rig when measured under normal drilling operations in 1983 were 80 dBA, 66.5 dBA, and 53 dBA for distances from the rig of 30 meters, 150 meters, and about 450 meters, respectively. The drilling rig would probably be operating for about 75 days. Figure 20 compares these noise levels with equivalent sounds.

Wildlife

Terrestrial Wildlife

The effects on wildlife would be short-term and based on temporary loss of habitat; that is, removal of forage and cover. Big game forage and cover on about 2.5 acres would be lost at the well site, staging area, and pipeline route but revegetation would, in time, replace some of this habitat. Temporary loss of wildlife habitat would be insignificant.

Drilling activities between September and December would overlap the big game breeding seasons, the hunting seasons, and the early part of winter range occupancy. Some big game would be displaced from all or portions of the Lost, Nameit, Clocktower, Pagoda, Grace, Cougar, Frost, Grizzly, Horse, Half-Mile, Elk Fork, Canyon, Green, Rand, Whit, Slack, Breteche, and Post creek drainages, as well as a portion of the North Fork of the Shoshone River bottom by helicopter noise along the flight path and human activity at the well site and staging area. An elk migration route may also be interrupted by these activities. It was estimated that elk would be displaced from a maximum of 39,000 acres of winter range if activities extended through December. This estimate was based on a projected displacement distance of 3 miles radius from the well site and 1 mile radius from the helicopter flight path corridor. Downslope winter range was also considered functionally lost due to interruption of the elk migration along this migration route. Bighorn sheep would be displaced from 20,600 acres of winter range, using a 3 mile well site radius and a 2 mile corridor radius. Mule deer would be displaced from 3,200 acres of winter range based on a one mile well site radius and half mile corridor radius. Moose would be displaced from 4,500 acres of yearlong range based on a one mile well site radius, and a half mile corridor radius (Wyoming Game & Fish Department, 1984). The displaced animals would seek habitat elsewhere, but could be more susceptible to mortality caused by predation, hunting, accidents, disease, increased energy expenditures, forced use of a poorer quality habitat and overcrowding (pressures of social interaction).

Despite restrictions that are stated as conditions of approval, increases in poaching and vehicle accidents could occur on the road to the staging area as the use of the road increases.

Estimated wildlife impacts are shown in Table 6.

Fisheries

The increase in sediment in Pagoda Creek from erosion of the drill pad and the water pipeline (1.5 tons per year) could degrade trout spawning areas. The water diversion could also hinder trout migration during spawning and destroy fish in the pump. However these impacts would be insignificant if sedimentation is kept to a minimum and significant water withdrawals do not occur during periods of critical flow.

Threatened or Endangered Species

The proposed action would not have a significant effect on either the peregrine falcon or the gray wolf.

Any bald eagles that happen to be near the North Fork of the Shoshone River between September

Figure 20

NOISE LEVEL COMPARISON CHART

North Fork Well Environmental Impact Statement

HOW IT FEELS	EQUIVALENT SOUNDS	DECIBELS	EQUIVALENT SOUNDS	HOW IT SOUNDS
Near permanent damage level from short exposure	*50 hp. siren (100 ft.)* *Jet Engine (75 ft.)*	**130**	*Jackhammer* *Chainsaw*	135dB(A) Approx. 64 times as loud as 75dB(A)
Pain to ears	*Turbo-fan jet at takeoff power (100 ft.)*	**120**	*Firecracker (15 ft.)* *Rock and roll band*	125dB(A) Approx. 32 times as loud as 75dB(A)
Uncomfortably loud	*Scraper-loader*	**110**	*Unmuffled motorbike (2-3 ft.)*	115dB(A) Approx. 16 times as loud as 75dB(A)
Discomfort threshold	*Jet fly over (1,000 ft.)* *Noisy newspaper press*	**100**	*Car horn* *Unmuffled cycle (25 ft.)*	105dB(A) Approx. 8 times as loud as 75dB(A)
Very loud Conversation stops	*Air compressor (20 ft.)* *Power lawnmower*	**90**	*Garbage trucks and city buses*	95dB(A) Approx. 4 times as loud as 75dB(A)
Intolerable for phone use	*Steady flow of freeway traffic* *10-HP outboard motor*	**80**	*Diesel truck (25 ft.)* *Garbage disposal* *Food blender*	85dB(A) Approx. 2 times as loud as 75dB(A)
Extra auditory physiological effects	*Automatic dishwasher* *Vacuum cleaner*	**70**	*Muffled jet ski (50 ft.)*	75dB(A)
	Window air conditioner outside at 2 ft.	**60**	*Passenger car, 65 mph. (25 ft.)* *Busy downtown area*	
Quiet	*Window air conditioner in room* *Occasional private auto at 100 ft.*	**50**	*Normal conversation*	55dB(A) Approx. ¼ as loud as 75dB(A)
Sleep interference	*Quiet home during evening hours* *Bird calls*	**40**		45dB(A) Approx. 1/8 as loud as 75dB(A)
	Library *Soft whisper 5 ft.*	**30**		35dB(A) Approx. 1/16 as loud as 75dB(A)
		20	*In a quiet house at midnight*	
	Leaves rustling	**10**		

Danger to hearing (Near permanent damage level to Very loud)

Very quiet (Quiet to 10)

Measured noise level when helicopter is 400 feet overhead (between 80 and 90)

Drilling rig at 200 feet from drill hole (between 60 and 70)

Existing ambient sound levels at drill sites (between 20 and 30)

Drilling rig at ½ mile from drill hole. (between 20 and 30)

Decibel levels of sounds you're most likely to encounter in A-scale numbers.

Note: Modified from the Federal Energy Regulatory Commission.

TABLE 6

ESTIMATED EFFECTS ON BIG GAME RESULTING FROM ALTERNATIVE I

Species	Habitat Lost[1] (Acres)	Big Game Winter Range Influenced By Drilling and Support Activities[2]		Projected Displacement[3] (Number of Animals)		Projected Future Hunting Opportunity Losses[4] (Number of Animals)	
		Acres	Percent of Total Winter Range in Herd Unit	Minimum	Maximum	Minimum	Maximum
Mule Deer	2.5	3,200	3	0	36	0	75
Bighorn Sheep	2.5	20,600	8	0	105	0	105
Moose	2.5	4,500	1	0	1	0	1
Elk	2.5	39,000	17	0	289	0	306

[1] Area of Surface Disturbance prior to revegetation.

[2] Winter range is considered limiting factor on big game. Acreage figures are map estimates based on projected displacement distances.

[3] Actual displacement is unknown. Maximum displacement equals the Wyoming Game and Fish Department existing big game population estimates multiplied by the percentage of the total winter range in the herd unit that would be influenced by drilling and support activities.

[4] Future maximum recreation opportunity losses can be figured by multiplying the Wyoming Game and Fish Department population objectives by the percentage of the total winter range in the herd unit that would be influenced by drilling and support activities. This assumes future big game populations at the objective level and that the project impacts result in a loss of future hunting opportunities.

and December could be disturbed enough by the helicopter flights and human activity at the staging area to displace them. Direct mortality due to accidents or poaching is possible.

There is also the potential for the grizzly bear to be affected. Grizzly bears might be displaced if their secure habitat should be reduced or if game prey species should be lost or displaced. Human activities and noise associated with machinery, helicopters, or drilling rigs could reduce the availability of areas near the drill site, staging area, and flight path for big game (prey) between September 9 and December 31. The potential would also increase for grizzly bear conflicts with humans working on the rig especially if the bears were attracted by human food and garbage. Appendix H includes the biological assessment and biological opinion concerning threatened or endangered species.

Visual Resources

No direct modification would occur on any "distinctive" variety class landscapes; all activities would occur on "common" variety class landscapes. Furthermore, all impacts would be short-term, and restoration potential is good at the drill site and staging area.

No facilities would be constructed on landscapes with "low" visual absorption capacity. Approximately 2.5 acres of disturbance would occur on the ridgetop, where visual absorption capacity is "moderate." Alterations for the helicopter staging area would be made where a "high" visual absorption capacity exists. Approximately 770 acres classified as sensitivity level I would be affected.

The minor reconstruction at the staging area would occur in a landscape classified for "Partial Retention" and would slightly affect the visual quality of the unit. The proposed drill site is on lands in the "modification" class. Its construction would have a slight impact on visual quality.

Outdoor Recreation

Generally, activities that cause surface disturbance, noise, odors, and increased access affect outdoor recreation settings. For safety reasons the actual sites used for the oil well and the staging area would not be available for recreation use during drilling and abandonment. Lands adjacent to the staging area, drill pad, and flight paths, which presently provide a semiprimitive recreation setting, would not be available for that use during exploration operations. The setting would temporarily shift, offering less natural character and seclusion, to provide a "rural" setting. About 2,000 acres would be affected in this way, but a semiprimitive setting would be available again once exploration activity ended.

These temporary changes in the recreation setting would cause a small amount of recreation use to be displaced to other locations. It is estimated that 30 visitor days of recreation use would be displaced, but the visitors would return to the area once operations had been completed.

Wilderness

Because of the remoteness of the site, its distance from established Forest Service trails, distance from identified high use areas within the Washakie Wilderness, and the short-term duration of the proposed action, the impact on the Washakie and North Absaroka Wilderness areas is judged to be slight.

Cultural Resources

The construction area has been inventoried and no sites eligible for the National Register would be effected. There is the potential for loss of cultural properties through indirect impacts such as vandalism or the operation of equipment outside authorized areas of disturbance.

Federal statutes protect cultural resources by requiring the identification, evaluation, and protection of cultural resources that would be affected by exploration and development or transportation of oil, gas, and energy minerals. Lease and operating plan stipulations to protect known and unknown cultural resources should effectively protect their values. Adherence to, and enforcement of, Federal and state laws, along with nonintrusion on locales or areas containing cultural resources, reduces the impacts caused by oil and gas activities. Cultural resource sites and objects revealed by exploration or development activities must be evaluated before operations are continued. If cultural properties of National Register quality are encountered, procedures specified in 36 CFR 800 will be followed.

Lands and Special Uses

Exploratory drilling should have no effect on nonrecreation special uses in the study area and little or no effect on current outfitting and guiding operations.

Transportation

Traffic would increase on roads leading to the study area. Estimated increases in the number of vehicles per week would be 25 for larger vehicles, 5 for medium vehicles, and 35 for smaller vehicles. The small vehicles would keep up with the flow of traffic and should cause no problems. The large and medium vehicles might cause temporary traffic slowups if they traveled at a slower rate than the normal traffic flow. These slowups would not be as noticeable in the fall as they would be during the three busy months of June, July, and August, when about 75 percent of the annual traffic occurs.

Aggregate sources for road construction and maintenance such as gravel might not be available in the study area and would have to be hauled in.

The Wyoming State Highway Department was consulted concerning the effects of increased traffic on U. S. Highway 14-16-20. They indicated that the Highway intersection with the access road to the staging area may need acceleration and deceleration lanes, turning lanes, through traffic lanes, and adequate signing to provide safe access.

Socioeconomic Conditions

Drilling the well would increase local employment and personal income, but the increase of an estimated 2 or 3 fulltime equivalent (FTE) jobs would be insignificant. For example, this change would amount to less than 1 percent change in employment and income in the mining sector of the local economy.

Similarly, the change in recreation use from the proposed well site to other recreation sites would not cause expenditures for gas, food, lodging, equipment, or services to change significantly. For example, if all 30 recreation visitor days displaced were elk hunting days lost, local expenditures would decline by an estimated $2,800 (based on 1980 Wyoming Game and Fish Department estimates adjusted for inflation at a rate of 1.08). If a commercial business such as outfitting used the well site or staging area, it would either shift its use to another area or experience a small short term decline in demand for its services.

Other than resentment and disappointment among some members of the North Fork, Cody, and Park County communities, there would be no significant or evident local social effects associated with implementing this alternative.

Similar operations nearby indicate that no detrimental effect on private property values in the surrounding area would be expected. For example, when in 1984, Penb Oreille Oil and Gas Co. drilled a well approximately seven miles east-northeast of the North Fork Well site, no decline in surrounding property values was reported.

Recommended Mitigation

1. Any vegetation removed for the surface water pipeline will be removed with hand tools and chain saws. All disturbed soils will be revegetated and water bars will be placed to reduce soil loss and stream sediment.
2. Lease stipulation C (Part 3) which prohibits any surface use between June 15 and September 7, shall be modified. All drilling and associated activity will begin after June 20 and be completed before December 1 to minimize big game displacement from winter ranges and to reduce potential impacts on grizzly bears.
3. All garbage will be flown to the staging area daily. All garbage will also be hauled from the staging area to sanitary landfill at least every other day. All food hauled to the drill site and garbage temporarily stored at the drill site or staging area will be stored in containers that would be inaccessible to bears.
4. Crews will not be allowed to carry firearms while working at the drill site or staging area or while traveling to or from the drill site. Marathon Oil Company will be responsible and accountable for enforcement.
5. All human activity may be temporarily stopped if necessary to resolve grizzly bear/human conflicts. See management measures for grizzly bears as stated in the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" for Management Situation 2 (Appendix I).
6. Marathon will have an approved application for approach onto Highway 14-16-20 prior to beginning any work on the Helicopter Staging Area. The application must meet the approval of the Wyoming State Highway Department's District Engineer.

Unavoidable Adverse Impacts

Alternative I would disturb 2.5 acres and cause the loss of an estimated 60 tons of soil. This is 1.5 times the amount that would be lost naturally from those 2.5 acres. Noise levels at the drill site would be an estimated 80 dBA for about 75 days and about 90 dBA under the flight path whenever a helicopter passed over. The estimated impacts on big game displacement would be significantly reduced if all drilling and related activities occurred before the winter range is occupied. However a relatively small number of animals could be displaced even if drilling occurred during the summer and early fall. About 2,000 semiprimitive nonmotorized acres of recreation setting would be affected for a short time. Approximately 770 acres classified as visual sensitivity level I would be affected for a short time.

If the recommended mitigating measures were adopted, the potential for adverse effects on the grizzly bear would be relatively small. Nevertheless, the project represents further encroachment on grizzly habitat and could compound the possibility of potential human/grizzly bear conflicts from other activities such as summer home use, lodge operations, and use of developed recreation sites. Thus, the cumulative effects of this project and other existing human activities might be adverse for grizzly bears.

Short-Term Use versus Long-Term Productivity; and Irreversible and Irretrievable Commitment of Resources

Generally, the environmental impacts associated with drilling and abandonment of the North Fork well would be considered short term. For example, 2.5 acres at the drill site would be disturbed for less than four months, although native vegetation on the area might take years to reestablish. Impacts on noise, wildlife, and recreation use would last only as long as the drill site and staging area were occupied.

Approximately 60 tons of soil would be lost. This is 1.5 times the amount that would be lost naturally from the 2.5 disturbed acres.

Impacts of Alternative I are displayed in Table 7.

Although field development is beyond the scope of this document and none would be permitted hereunder, it is noted that drilling this well successfully would increase the demand that additional development activities be considered.

If any well produces commercial quantities of oil or natural gas, the probability of more wells increases. For every producing well there could be a service road, a supply of power for the pump, and a means of transporting the oil or gas to a processing facility. Development of the area would be characterized by: (1) further exploration, which includes all activities from the decision to explore through the drilling of other wells; (2) operation and maintenance of producing wells; and (3) abandonment after production ceases.

The consequences of field development would depend on the extent, location, duration, and timing of development activities. It is impossible to anticipate if or exactly how the area would be developed.

TABLE 7

ESTIMATED IMPACTS OF ALTERNATIVE I

	Short Term	
	Without Recommended Mitigation	With Recommended Mitigation
Approximate Area Disturbed (Acres)	3	3
Soil Erosion Increased (Tons)	20	20
Noise Level Increased at Well Site and Flight Path (dBA)	94	94
Elk Displaced (Number)	0-289	0-15
Mule Deer Displaced (Number)	0-36	0-10
Bighorn Sheep Displaced (Number)	0-105	0-20
Moose Displaced (Number)	0-1	0-1
Elk Winter Range Functionally Unavailable (% of Herd Unit)	17	0
Mule Deer Winter Range Functionally Unavailable (% of Herd Unit)	3	0
Bighorn Sheep Winter Range Functionally Unavailable (% of Herd Unit)	8	0
Moose Winter Range Functionally Unavailable (% of Herd Unit)	1	1
Visual Quality Impacts	Slight	Slight
Recreation Setting Temporarily Changes (Acres)	2,000	2,000
Recreation Visitor Days Displaced (RVDs)	30	30

ALTERNATIVE II: DRILLING THE NORTH FORK WELL WITH ROAD ACCESS

Introduction

Many of the impacts associated with Alternative II would be similar to those of Alternative I. The main differences between the two alternatives is that under Alternative II approximately 4.2 miles of road would be constructed or upgraded instead of helicopters being used for access to the same drill site. Building a road would require at least an additional month for construction and probably longer for reclamation. However, Alternative II would not require a helicopter staging area, nor would a water pipeline to Pagoda Creek be necessary, since water could be trucked to the well site.

The impacts on the geology, groundwater, and wilderness would be the same as those identified for Alternative I.

Soils and Vegetation

Approximately 14 acres of mountain slopes and ridgetop soils would be disturbed. This disturbance would cause an estimated 750 tons of soil to erode beyond natural levels before restoration. About 11 acres of mountain slope would be permanently impaired following restoration. Eight acres of timber and 6 acres of grassland/shrublands would be disturbed.

Water Resources

Road construction up the Pagoda Creek drainage could significantly affect water quality. The road prism would be adjacent to the stream and would encroach on the floodway in several places, introducing sediment from road drainage and cut and fill slope erosion. Sediment would also come from road construction on the side slope from Pagoda Creek to the well site. Initially sediment would increase by about 70 tons per year, but the amount could be reduced with intensive cut and fill slope stabilization, revegetation, road drainage and sediment detention structures during reclamation. Water quality on about two miles of Pagoda Creek would temporarily drop below Class II water quality standards.

Wetlands and Floodplains

Road construction along Pagoda Creek would eliminate or reduce the utility of about 60 acres of riparian wetland. Clearing the riparian vegetation for the access road would place large amount of fill material in wetlands and would greatly alter the hydrologic function of the area. The riparian vegetation root matrix would be eliminated, soil characteristics would be altered by compaction and lack of cover, incoming water would no longer be effectively filtered, nutrients would not be cycled, and recharge would be greatly reduced and replaced by direct runoff. The sediment retention potential of streamside zones would be eliminated in disturbed areas, becoming instead a direct source of sediment. These changes would degrade water quality in adjacent streams by increasing sediment loads and nutrients in the form of dissolved solids or ions absorbed on newly contributed organic and soil materials. Changes in the stream's buffering capacity and in pH could be expected. Decreased subsurface recharge and increased runoff rates would raise stream temperatures and increase erosion and peak flows (Darnell, 1976).

About 15 acres of floodways in Pagoda Creek would also be altered. The road could modify the characteristics of the channel and floodway, especially if portions of it would be washed out during a flood. The occupation of floodplains would increase the potential for safety hazards and property loss. It could also degrade aquatic habitat. Cleared riparian areas and floodplains would be unprotected during the runoff season, and soil stockpiles, drilling fluids, and other materials stored on site could be washed into flood flows.

Air Quality

Dust and emissions would result from the building and upgrading of 4.2 miles of road to the well site and from emissions from bulldozers used to build the road and drill pad. Emissions would also increase from trucks traveling to and from the well site. Dust might increase by an estimated 2 tons per mile of road over a five-month period. The increased dust and emissions would be most apparent to people along the road access corridor during construction and reclamation.

Noise

The noise levels from the drilling rig would be similar to those for Alternative I; however, instead of noise from helicopters along the flight path over Clocktower Creek, noise would be caused by road construction activities and vehicle traffic to the well site. This would be most noticeable along the travel corridor in the Pagoda Creek drainage.

Wildlife

Terrestrial Wildlife

The types of wildlife impacts from Alternative II would be similar to those of Alternative I. Big game habitat would be lost on 14 acres. All of this surface disturbance would be on big game winter range.

Some big game animals will be displaced by noise and human activity from all or portions of Lost, Nameit, Clocktower, Pagoda, Grace, Cougar, Frost, Elk Fork, Horse, Grizzly, Post, Breteche, Slack, Whit, Rand, Green, Canyon and Half-Mile creek drainages, and a portion of the North Fork of the Shoshone River bottom from this alternative by vehicle traffic and noise along Pagoda Creek and human activity at the well site. Elk would be displaced from 42,200 acres of winter range if activities extend through December; mule deer from 2,600 acres; bighorn sheep from 20,600 acres; and moose from 4,800 acres of yearlong range. These animals would return, over time, to these ranges after human activity ceased and the road was permanently closed and the habitat is reestablished.

The road access would be tightly controlled to allow only necessary traffic to the drill site. The opportunity for unauthorized access remains, however, and unauthorized access leads to more direct mortality by way of accidents and poaching.

The anticipated impacts on wildlife from this alternative are summarized in Table 8.

TABLE 8

ESTIMATED EFFECTS ON BIG GAME RESULTING FROM ALTERNATIVE II

		Big Game Winter Range Influenced By Drilling and Support Activities[2]		Projected Displacement[3] (Number of Animals)		Projected Future Hunting Opportunity Losses[4] (Number of Animals)	
Species	Habitat Lost[1] (Acres)	Acres	Percent of Total Winter Range in Herd Unit	Minimum	Maximum	Minimum	Maximum
Mule Deer	14	2,600	3	0	36	0	75
Bighorn Sheep	14	20,600	8	0	105	0	105
Moose	14	4,800	1	0	1	0	1
Elk	14	42,200	19	0	323	0	342

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[1] Area of Surface Disturbance prior to revegetation.

[2] Winter ranga is considered limiting factor on big game. Acreage figures are map estimates based on projected displacement distances.

[3] Actual displacement is unknown. Maximum displacament aquals tha Wyoming Gama and Fish Department existing big game population estimates multiplied by the parcantaga of the total wintar range in the herd unit that would be influenced by drilling and support activities.

[4] Futura maximum recreation opportunity losses can be figured by multiplying the Wyoming Game and Fish Department population objectives by the percentage of the total winter range in the herd unit that would be influenced by drilling and support activitias. This assumes future big game populations at the objective level and that the project impacts result in a loss of future hunting opportunities.

Fisheries

Road construction would increase sediment and release various nutrients into Pagoda Creek. It also would alter or eliminate habitat such as instream cover, stream bank cover, and spawning areas. These impacts would be most apparent in the lower mile of Pagoda Creek, where recent Wyoming Game and Fish Department surveys show value class III characteristics.

Excess turbidity caused by runoff from the roadway could delay or prevent trout spawning. Spawning habitat in Pagoda Creek might be eliminated by low to moderate amounts of surface disturbance along the stream and in the drainage. Increased sediments would reduce cover by filling pools, reduce the amount of habitat for spawners, decrease or eliminate the critical exchange of water between surface and intergravel flow, and inhibit the emergence of fry from spawning gravels. Excessive sedimentation in Pagoda Creek caused by road construction would alter channel characteristics by filling pools and causing bank recession. This would cause shallow, high velocity flows during critical spawning periods.

Sedimentation and decreased water quality would also affect food production within trout rearing areas. Reduced space, caused by pool filling, shallow flows, and significant changes in the pool/riffle ratio would reduce food and cover for trout and could cause a short-term increase in predation and perhaps a long-term decrease in populations.

Threatened or Endangered Species

Like Alternative I, Alternative II might displace grizzly bears from their secure habitat as prey species are lost or displaced. Human activities and noise associated with machinery, vehicles, or drilling rig could reduce the availability of areas near the drill site and road corridor for prey species and grizzly bears between September 9 and January 1. The potential would also increase for conflicts between grizzlies and humans working on the road and at the well site, especially if bears were attracted by human food and garbage. Construction of a road in the narrow riparian zone of Pagoda Creek would also destroy a small area that produces succulent food for the grizzly bear during the spring.

Machinery and human activity at the road and well site could cause enough disturbance to displace any bald eagles that might happen to be near the North Fork of the Shoshone River between September and January. Direct mortality due to accidents or poaching is possible.

There would be no anticipated effects on the peregrine falcon or the gray wolf.

Appendix H contains the biological assessment and biological opinion concerning threatened or endangered species.

Visual Resources

Some modification would occur on "distinctive" variety class landscapes. Approximately ½ mile of road would be constructed in upper Pagoda Creek on landscapes judged "distinctive." An additional 2.5 miles of road would be added on "common" variety class landscapes along the bottom and side slopes of Pagoda Creek and along the ridge between Grace and Pagoda Creeks. Restoration potential for about one-third of the total road length is poor, so that some long-lasting impacts could occur on these landscapes.

Two miles of the new road would be in landscapes with low visual absorption capacity. Since about one-third of this is judged to have poor restoration potential, the impact would be severe on this portion of the landscape. Another 1.3 miles of road construction would be on landscapes with moderate to high visual absorption capacity where the restoration potential is good.

About 770 acres classified as sensitivity level I would be affected.

Three miles of the road would be constructed in landscape response unit "maximum modification;" this would result in a moderate impact.

Overall, Alternative II would be expected to have a moderate impact on the visual resource.

Outdoor Recreation

Alternative II would directly affect about 1,700 acres of "semiprimitive nonmotorized" category areas. Road construction and use would change the setting opportunity on the affected acreage to the "rural" category during actual construction, use, and reclamation. Once actual work ended, the area would revert to a "roaded natural" setting, and over a number of years it might return to a "semiprimitive" setting if reclamation and natural processes returned the disturbed area to a natural-appearing condition.

It is estimated that 50 to 100 visitor days of recreation use would be displaced from the affected area during road construction and drilling operations. Once operations ended, recreation use would probably return to approximately the existing levels, but the recreation experience that the users would obtain would be based on a less natural setting.

Wilderness

The effect on nearby established wilderness areas would be similar to the impacts described for Alternative I.

Cultural Resources

No cultural inventory of the access road has occurred since the exact road alignment has not been identified. However, this is required before any surface disturbing activities occur. Until the inventory is complete exact cultural impacts are unknown.

The most likely impact on cultural resources would be caused by construction activities requiring earth moving that might disturb archeological site context, mix strata, or scatter surface deposits. There is also the potential for loss of cultural properties through indirect impacts such as vandalism or the operation of equipment outside authorized areas of disturbance.

Federal statutes protect cultural resources by requiring the identification, evaluation, and protection of cultural resources that would be affected by exploration and development or transportation of oil, gas, and energy minerals. Lease and operating plan stipulations to protect known and unknown cultural resources should effectively protect their values. Adherence to, and enforcement of, Federal and state laws, along with nonintrusion of locales or areas containing cultural resources, reduces the impacts caused by oil and gas activities. Cultural resource sites and objects revealed by exploration or development activities must be evaluated before operations are continued. If cultural properties of National Register quality are encountered, procedures, specified in 36 CFR 800 will be followed.

Lands and Special Uses

The increased vehicle traffic, including heavy equipment, on the access road to the well site could disturb the people using the summer homes along Pagoda Creek. Increased noise, dust, and traffic would all temporarily degrade the aesthetic setting of these homes until after abandonment.

Transportation

Traffic would increase in the short-term on U. S. Highway 14-16-20 and the road up Pagoda Creek. In addition to the traffic increase associated with the drilling operations, a large number of large trucks and heavy equipment would have to haul material in and out of the area to build and eventually reclaim the access road to the well site. Traffic control might be necessary to provide safe access.

Socioeconomic Conditions

The economic impacts of Alternative II would be similar to those described for Alternative I. Since this alternative involves building a road to the well site, some residents would be disappointed, frustrated and resistant. This would be the major social effect associated with this alternative.

Recommended Mitigation

1. Lease stipulation C (part 3) which prohibits any surface use between June 15 and September 7, shall be modified. All drilling and associated activity will begin after June 20 and be completed before December 1 to minimize big game displacement from winter ranges and to reduce potential impacts on grizzly bears.
2. All garbage will be hauled from the well site to a sanitary landfill daily. All food and garbage temporarily stored at the drill site will be stored in an airtight container that is inaccessible to bears.

3. Crews will not be allowed to carry firearms while working at the drill site or staging area or while traveling to or from the drill site. Marathon Oil Company will be responsible and accountable for enforcement.
4. All activity may be temporarily stopped if necessary to reduce grizzly bear/human conflicts. See management measures for grizzly bears as stated in the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" for Management Situation 2 (Appendix I).
5. Access to the site will be tightly controlled by posting a guard to allow only authorized personnel to access the site by vehicle.
6. See Appendix F for mitigation associated with actual road construction.
7. Marathon will have an approved application for approach onto Highway 14-16-20 prior to beginning any work on the Helicopter Staging Area. The Application must meet the approval of the Wyoming State Highway Department's District Engineer.

Unavoidable Adverse Impacts

Alternative II would disturb approximately 14 acres and cause the loss of an estimated 750 tons of soil beyond natural levels. About 11 acres of mountain slope would be permanently impaired following reclamation. Dust would increase by an estimated 2 tons per mile of road over a five month-period. This increase would be due mostly to building and abandoning the access road.

Noise levels along the access road would increase from when road construction began until it was abandoned. Noise levels at the well site would increase by an estimated 80 dBA for about 75 days.

The estimated impacts on big game displacement would be significantly reduced if all drilling and related activities occurred before the winter range is occupied. However some animals could be displaced even if drilling occurred during the summer and early fall.

Approximately ½ mile of road would be constructed along upper Pagoda Creek would occur on landscapes in the "distinctive" variety class. An additional total of 2.5 miles would occur on "common" variety landscapes. Restoration potential for about one-third of the total road length is poor, so that severe long-lasting impacts to the landscapes would result. Two miles of road would be in landscapes with low visual absorption capacity. Road construction would also permanently change the affected area from a semiprimitive nonmotorized setting to a roaded natural setting, at least until reclamation of the road was substantially complete.

The effect on nearby established wilderness areas would be similar to the impacts described for Alternative I.

Traffic would increase in the short-term on U.S. Highway 14-16-20 and the road up Pagoda Creek. In addition to the traffic increase associated with Alternative I, many large trucks and other heavy equipment would haul material in and out of the area to build and eventually reclaim the access road to the well site.

Since this alternative involves building a road to the well site, some residents would be disappointed, frustrated and resistant. This would be the major social effect associated with this alternative.

The recommended mitigation would reduce the potential adverse effects on grizzly bears. Nevertheless, this alternative represents further encroachment on grizzly habitat and could compound the possibility of conflicts between humans and grizzlies. The cumulative effects on this project and other existing human activities could be adverse for grizzly bears.

Short-Term Use versus Long-Term Productivity; Irreversible and Irretrievable Commitment of Resources

Generally the environmental impacts associated with drilling and abandoning the well would be short term. However, some of the impacts from road construction would be permanent. For example, the productivity of 11 acres of mountain slopes would be permanently impaired and 750 tons of soil would be lost beyond natural levels. About one-third of the road length would have poor restoration potential and would have lasting impacts on landscapes. Road construction would also permanently change the area from a semiprimitive setting to a nonmotorized roaded natural setting.

Impacts of Alternative II are displayed in Table 9.

Although field development is beyond the scope of this document and none would be permitted hereunder, it is noted that drilling this well successfully would increase the demand that additional development activities be considered.

TABLE 9

ESTIMATED IMPACTS OF ALTERNATIVE II

	Short Term	
	Without Recommended Mitigation	With Recommended Mitigation
Area Disturbed (Acres)	14	14
Soil Erosion Increased (Tons)	750	750
Area Permanently Impaired (Acres)	11	11
Dust Increased (Tons)	8	8
Noise Level at Well Site Increased (dBA)	80	80
Elk Displaced (Number)	0-323	0-20
Mule Deer Displaced (Number)	0-36	0-10
Bighorn Sheep Displaced (Number)	0-105	0-20
Moose Displaced (Number)	0-1	0-1
Elk Winter Range Functionally Unavailable (% of Herd Unit)	19	0
Mule Deer Winter Range Functionally Unavailable (% of Herd Unit)	3	0
Bighorn Sheep Winter Range Functionally Unavailable (% of Herd Unit)	8	0
Moose Winter Range Functionally Unavailable (% of Herd Unit)	1	1
Violate Class II Water Quality Standards (Miles)	2	2
Sediment Yield Increased (Tons/Year)	70	70
Wetland Characteristics Altered (Acres)	60	60
Floodways Altered (Acres)	15	15
Fishery Value Class III Stream Characteristics Altered (Miles)	1	1
Trout Spawning Stream Miles Altered	2	2
Visual Quality Impacts	Moderate	Moderate
Recreation Setting Changes (Acres)	1,700	1,700
Recreation Visitor Days Displaced (RVDs)	50	50

If any well produces commercial quantities of oil or natural gas, the probability of more wells increases. For every producing well there could be a service road, a supply of power for the pump, and a means of transporting the oil or gas to a processing facility. Development of the area would be characterized by: (1) further exploration, which includes all activities from the decision to explore through the drilling of other wells; (2) operation and maintenance of producing wells; and (3) abandonment after production ceases.

The consequences of field development would depend on the extent, location, duration, and timing of development activities. It is impossible to anticipate if or exactly how the area would be developed.

ALTERNATIVE III: DRILLING AT THE GRACE CREEK SITE

Introduction

Alternative III would involve drilling at a different location, the Grace Creek Site in Section 28, T52N, R106W. Access to the site would be by helicopter.

Many of the impacts associated with Alternative III would be similar to those described for Alternative I, even though they would use different drill sites and helicopter staging areas. For example, the impacts on geology, groundwater, air, noise, threatened or endangered plant species, wilderness, transportation, and economics would be similar.

The worst case analysis of a blowout and geothermal impacts would be similar to Alternative I; however, a blowout would not affect Pagoda Creek since a high ridge separates Grace Creek and Pagoda Creek drainages.

The worst case analysis of a spill from this location would be somewhat different than for Alternative I and II. Here the reserve pit would be uphill and cut into the base of the slope with provisions for drainage around the reserve pit so surface runoff from the adjacent slopes does not enter the reserve pit. Although very unlikely, a spill could occur if the pit overflow because of improper drilling mud management, an uncontrolled flow of formation water, or an extremely heavy rainfall that causes runoff to flood into the pit.

This "worst case" analysis is also equally difficult to quantify. A spill could reach Grace Creek quickly before it is controlled. This could temporarily degrade water quality in Grace Creek and if uncontrolled reach Elk Fork and then the North Fork. This too could have unpredictable negative impacts on soils, vegetation, water resources, wetland, floodplains, fish, wildlife, visual resources, recreation, cultural resources, special uses, transportation, and social and economic conditions.

Soils and Vegetation

Construction of a suitable drill pad would require excavation of at least one side of the draw. This would result in a 100 to 150 foot cut slope. Some of this cut slope would be in bedrock. The site is on relatively gentle ground where spills and overflows could be quickly contained before they reached Grace Creek. Since the surface formation consists of tertiary volcanics (Wapiti Formation) slope stability may be a problem.

Approximately 11 acres would be disturbed under Alternative III, and the disturbance would cause an estimated 210 tons of erosion. This is four times the amount that would occur naturally from those 11 acres. Most of the disturbance would result from construction of the road and staging area along Elk Fork Creek. This disturbance would take place on landscapes with high restoration and reclamation potential and low sediment delivery ratios. Hence, very little eroded soil would reach the drainageways. Native vegetation would be reestablished within 10 to 20 years after restoration.

Water Resources

Alternative III would not significantly affect the quality or quantity of the water flowing in Grace Creek or Elks Fork, nor would wider uses within the study area be affected. Approximately 14 tons of eroded soil would be introduced into Elk Fork over the ten-year period that would be necessary for the disturbed sites to return to natural erosion rates. That amount of sediment delivered over a period of ten years would be insignificant when compared to natural sediment loads in Elk Fork.

Wetlands and Floodplains

Approximately 9 acres of floodplain/riparian area would be disturbed by construction of the road and staging area. However, since restoration and reclamation potential is estimated to be good, the overall short-term and long-term impacts on the floodplain would be low.

The riparian vegetation could be destroyed. This vegetation includes snowberry, currant, rose, and bluegrass. Erosion would deposit silt in downstream areas of Grace Creek and Elk Fork Creek. Alterations of the relatively stable grassy channel area might accelerate headcutting and downstream erosion of the channel.

Since the reclamation and restoration potential is good, the period of accelerated erosion would be limited to 3 to 5 years. Reclamation could restore the site productivity to natural levels.

Wildlife

Terrestrial Wildlife

The type of wildlife impacts of Alternative III would be similar to those of Alternative I, but the magnitude would differ. Surface disturbance would remove roughly 11 acres of habitat that provides forage for big game animals, at least until revegetation could be accomplished.

Big game would be displaced from all or portions of the Nameit, Clocktower, Pagoda, Grace, Cougar, Elk Fork, Clearwater, Sweetwater, Horse, and Grizzly creek drainages, as well as a portion of the North Fork of the Shoshone River bottom during the exploration activities. Elk would be displaced from an estimated 18,000 acres of winter range; bighorn sheep from 19,200 acres of winter range; mule deer from 2,900 acres of winter range; and moose from 2,900 acres of year-round habitat. The displacement would cease when the human activity ended and the animals would return, over time, as the habitat is reestablished.

Direct mortality such as poaching and accidents resulting from human activities would be similar to that described for Alternative I.

The anticipated effects on big game from this alternative are summarized in Table 10.

Fisheries

Sediment levels in Grace Creek and Elk Fork Creek would probably increase, especially during pad construction. Water flow would decrease later if water was diverted and used in drilling. The increased sediment concentration would alter fishery habitat in the manner discussed for Alternatives I and II. The extent of the impact on Grace Creek is unknown because even though it is classified as a value class III stream (substantial fishery resource according to the 1978 Wyoming Stream Evaluation), recent Wyoming Game and Fish surveys found no fishery in Grace Creek.

Threatened or Endangered Species

No effect would be expected on the peregrine falcon or the gray wolf from Alternative III.

Anticipated impacts on the bald eagle and grizzly bear would be similar to those of Alternative I; however, construction of the staging area and drill site in the riparian zones of Elk Fork and Grace Creek drainages would destroy a small area that produces succulent food for the grizzly bear during the spring.

Appendix H contains the biological assessment and biological opinion concerning threatened or endangered species.

TABLE 10

ESTIMATED EFFECTS ON BIG GAME RESULTING FROM ALTERNATIVE III

		Big Game Winter Range Influenced By Drilling and Support Activities[2]		Projected Displacement[3] (Number of Animals)		Projected Future Hunting Opportunity Losses[4] (Number of Animals)	
Species	Habitat Lost[1] (Acres)	Acres	Percent of Total Winter Range in Herd Unit	Minimum	Maximum	Minimum	Maximum
Mule Deer	11	2,600	3	0	36	0	75
Bighorn Sheep	11	19,200	8	0	105	0	105
Moose	11	2,900	1	0	1	0	1
Elk	11	18,000	8	0	136	0	144

[1] Area of Surface Disturbance prior to revegetation.

[2] Winter range is considered limiting factor on big game. Acreage figures are map estimates based on projected displacement distances.

[3] Actual displacement is unknown. Maximum displacement equals the Wyoming Game and Fish Department existing big game population estimates multiplied by the percentage of the total winter range in the herd unit that would be influenced by drilling and support activities.

[4] Future maximum recreation opportunity losses can be figured by multiplying the Wyoming Game and Fish Department population objectives by the percentage of the total winter range in the herd unit that would be influenced by drilling and support activities. This assumes future big game populations at the objective level and that the project impacts result in a loss of future hunting opportunities.

Visual Resources

The helicopter staging area and well site are in locations in the "common" visual variety class with "low" visual sensitivity. Both locations have visual quality objectives allowing for "modification." Overall visual resource impacts from Alternative III would be expected to be slight, and it should be possible to restore both sites to a nearly natural appearance.

Outdoor Recreation

The effects of Alternative III would be similar to those projected for Alternative I, but they would apply to a smaller area. The setting on 800 acres of land classified as semiprimitive would temporarily shift to a "rural" or "roaded natural" classification, but it would return to the existing classification when operations terminated.

Road construction activity would occur along and within view of a major campground and forest trail. However, the impact on recreation would be considerably greater than Alternative I or II because drilling could occur between June 21 and December 31. Hence, the peak recreation use season could be affected.

Recreation use would be displaced temporarily to other locations. The extent of impact on visitors using the Elk Fork Campground is uncertain but a displacement of more than 350 RVDs of use would occur in the hunting, horseback, and dispersed camping categories. Traffic passing by the campground enroute to and from the staging area and nearby helicopter operations would alter the recreation experience of campground visitors.

Cultural Resources

No cultural inventory of this alternative's drill site, helicopter staging area or access road has occurred. However, this is required before any surface disturbing activities occur. Until the inventory is complete exact cultural impacts are unknown

The most likely impact on cultural resources would be caused by construction activities requiring earth moving that might disturb archeological site context, mix strata, or scatter surface deposits. There is also the potential for loss of cultural properties through indirect impacts such as vandalism or the operation of equipment outside authorized areas of disturbance.

Federal statutes protect cultural resources by requiring the identification, evaluation, and protection of cultural resources that would be affected by exploration and development or transportation of oil, gas, and energy minerals. Lease and operating plan stipulations to protect known and unknown cultural resources should effectively protect their values. Adherence to, and enforcement of, Federal and state laws, along with nonintrusion on locales or areas containing cultural resources, reduced the impacts caused by oil and gas activities. Cultural resource sites and objects revealed by exploration or development activities must be evaluated before operations are continued. If cultural properties of National Register quality are encountered, procedures specified in 36 CFR 800 will be followed.

Social Conditions

The major local social effect caused by implementing this alternative would be the short term loss among some residents of a highly valued local recreational area.

Recommended Mitigation

1. To reduce potential impacts on grizzly bears and big game animals, occupancy during exploration will be limited to the period from June 21 to November 30.
2. All garbage will be flown to the staging area daily. All garbage will also be hauled from the staging area to sanitary landfill every other day. All food hauled to the drill site and garbage temporarily stored at the drill site will be stored in an container that would be inaccessible to bears.
3. Crews will not be allowed to carry firearms while working at the drill site or staging area or while traveling to or from the drill site. Marathon Oil Company will be responsible and accountable for enforcement.
4. All human activity may be temporarily stopped if necessary to resolve grizzly bear/human conflicts. See management measures for grizzly bears as stated in the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" for Management Situation 2 (Appendix I).
5. See Appendix F for mitigation associated with actual road construction.

Unavoidable Adverse Impacts

Unavoidable adverse impacts would be the same as those described for Alternative I. However, if the recommended mitigation measures are adopted, the potential for adverse effects on the grizzly bear would be reduced. Nevertheless, the project represents further encroachment on grizzly habitat and could compound the possibility of potential human/grizzly bear conflicts from other activities such as summer home use, lodge operations, and use of developed recreation sites. Thus, the cumulative effects of this project and other existing human activities might adversely affect grizzly bears. More than 350 RVDs of recreation use would be displaced, especially if drilling and support activities occur during the summer when the number of RVDs displaced would increase.

The estimated impacts on big game displacement would be significantly reduced if all drilling and related activities occurred before the winter range is occupied. However a relatively small number of animals could be displaced even if drilling occurred during the summer and early fall.

Short-Term Use versus Long-Term Productivity; Irreversible and Irretrievable Commitment of Resources

Generally the environmental impacts associated with drilling and abandoning the well would be short-term. For example, the drill site would be disturbed for less than four months, although native vegetation on the area might take a few years to become reestablished. Impacts on noise, wildlife, and recreation use would last only as long as the drill site and staging area were occupied.

The estimated impacts of Alternative III are displayed in Table 11.

Although field development is beyond the scope of this document and none would be permitted hereunder, it is noted that drilling this well successfully would increase the demand that additional development activities be considered.

If any well produces commercial quantities of oil or natural gas, the probability of more wells increases. For every producing well there could be a service road, a supply of power for the pump, and a means of transporting the oil or gas to a

TABLE 11

ESTIMATED IMPACTS OF ALTERNATIVE III

	Short Term	
	Without Recommended Mitigation	With Recommended Mitigation
Area Disturbed (Acres)	11	11
Soil Erosion Increased (Tons)	158	158
Noise Level Increased at Well Site and Flight Path (dBA)	94	94
Elk Displaced (Number)	0-136	0-20
Mule Deer Displaced (Number)	0-36	0-10
Bighorn Sheep Displaced (Number)	0-105	0-20
Moose Displaced (Number)	0-1	0-1
Elk Winter Range Functionally Unavailable (% of Herd Unit)	8	0
Mule Deer Winter Range Functionally Unavailable (% of Herd Unit)	3	0
Bighorn Sheep Winter Range Functionally Unavailable (% of Herd)	8	0
Moose Winter Range Functionally Unavailable (% of Herd)	1	1
Sediment Yield Increased (Tons/Year)	14	14
Wetland Characteristics Altered (Acres)	9	9
Floodways Altered (Acres)	9	9
Visual Quality Impacts	Slight	Slight
Recreation Setting Changes (Acres)	800	800
Recreation Visitor Days Displaced (RVDs)	more than 350	more than 350

processing facility. Development of the area would be characterized by: (1) further exploration, which includes all activities from the decision to explore through the drilling of other wells; (2) operation and maintenance of producing wells; and (3) abandonment after production ceases.

The consequences of field development would depend on the extent, location, duration, and timing of development activities. It is impossible to anticipate if or exactly how the area would be developed.

ALTERNATIVE IV: "NO ACTION"

Alternative IV is the "no action" alternative. As explained in Chapter I, the possibility of denying the APD is limited by terms of the exiting lease.

Oil and gas lease W-73230 contains various stipulations enabling the Department of the Interior to impose "such reasonable conditions, not inconsistent with the purposes for which...[the] lease is issued, as the...[BLM] may require to protect the surface of the leased lands and the environment" before approving any surface-disturbing activity. With one exception, however, none of the stipulations would enable the Secretary of the Interior to deny all drilling activity because of environmental concerns. The one provision that expressly empowers such denial reads as follows:

> The Forest Service is responsible for assuring that the area to be disturbed is examined, prior to undertaking any ground disturbing activities on lands covered by this license/permit/lease, to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow any use and occupancy that would detrimentally affect any of the endangered or threatened plant or animal species.

Nevertheless, the stipulations empowers the discretionary rejection of all activity only in limited circumstances; namely, when the activity would "detrimentally affect" an endangered or threatened species.

Analysis of the possible presence of threatened and endangered species of plants and animals in the study area is provided in Chapter II of this EIS. The consequences of each alternative on the species considered are described in Chapter III. The biological assessment reveals that if the recommended protection measures listed are included, there would be no "detrimental effect" on the peregrine falcon, or the gray wolf. However, the grizzly bear and bald eagle may be affected (Appendix H).

The U. S. Fish and Wildlife Service further considered the possibility of adverse effects on the grizzly bear and bald eagle and concluded that the exploratory phase of the proposed North Fork Well APD is not likely to jeopardize the continued existence of any endangered or threatened plant or animal species. Thus, the "no action" alternative is beyond the BLM's authority to select.

Under the no action alternative, the existing human and environmental conditions and trends would not be affected. The affected environment described in Chapter II reasonably represents the existing conditions and trends. However the "no action" alternative would not allow oil and gas to be produced. It could also have a detrimental economic effect on the lease holders and operators.

CHAPTER IV

CONSULTATION AND COORDINATION

PREPARERS

Interdisciplinary Team

This EIS was prepared by an interdisciplinary team. The team members are listed below.

Marty Connolly, Environmental Scientist. B.S. Geology, University of Minnesota, 1971. Employed by the USGS, Department of Interior, as an Environmental Scientist. Primary responsibility, preparing environmental documents for Applications for Permit to Drill oil and gas wells and other related oil and gas activities. Currently employed by the BLM in the same capacity.

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David L. Henry, Wildlife Biologist. M.A. Wildlife Management, University of Missouri, 1970; B.S. Wildlife Management, University of Missouri, 1967. Employed by USFS. Primary responsibility, general wildlife management and threatened and endangered species program management.

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Robert Rossman, Hydrologist. B.S. Watershed Science/Hydrology, Colorado State University, 1976. Employed by USFS 1978 to present. Primary responsibility, water resources, fisheries, and fire.

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Support Services

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SCOPING AND ISSUES IDENTIFICATION

Major issues and the scoping process are discussed in the introduction of the EIS. As explained there, the BLM and the Forest Service received numerous letters before the first draft of this EIS was prepared. The letters expressed concern for wildlife, wilderness, tourism, scenic quality, vehicle access, water quality, housing oil industry employees, local economic development, and the geothermal resources in Yellowstone National Park if the North Fork Well was drilled and an oil field was developed.

Other issues and concerns were identified regarding effects on elk, bighorn sheep, grizzly bears, threatened and endangered species, stream quality, visual quality, traffic on the Yellowstone Highway, air quality, and the character of the area.

A public "scoping" process meeting identified additional public concerns regarding effects on commercial users, the local economy, the stability of the oil and gas industry, the Washakie Wilderness, access, public attitudes, property values, instream water flows, mineral potential, tourism, the effects on Federal oil and gas leasing, and effects on rights of mineral lessees.

All concerns identified were carefully considered during development of the DEIS. Analysis of the responses to the DEIS did not reveal substantially new issues; rather, comments primarily criticized the adequacy or alleged obsolescence of the data used.

CONSULTATION AND COORDINATION IN PREPARATION OF THE DOCUMENT

The U.S. Fish and Wildlife Service was asked to provide any listed and proposed threatened and endangered species that may be present in the study area. A biological assessment describing the effects was sent to the Fish and Wildlife Service, thus initiating formal consultation through the agency's Endangered Species Office. Section 7(d) of the Endangered Species Act requires that during the consultation process no irreversible or irretrievable commitment of resources will occur that would preclude the formulation of reasonable and prudent alternatives.

The Wyoming Game and Fish Department provided habitat acreage figures, herd unit maps, and technical commentary regarding the affected environment and environmental impacts. Similar information was provided by wildlife researchers from the University of Wyoming. This information, along with the wildlife inventory and planning data of the Shoshone National Forest, formed the basis for the wildlife portions of this analysis.

The Wyoming Game and Fish Department also provided critical technical review to the EIS team during 3 different work sessions on the drafts of the EIS. They also provided formal local and departmental level review to the "mark-up" and printed versions of the EIS.

Beyond this, the Wyoming Game and Fish Department reviewed a preliminary copy of the final EIS and considered it to be an improvement over the draft EIS and concluded that "this document provides sufficient information to assess the proposed action." The agency recommended three additional mitigative measures for inclusion under Alternatives I, II and III:

1. Marathon should be required to mitigate, by some means, the impacts to big game harvest in the Grace Creek-Pagoda Creek area. Possible mitigative measures might include making access available to a similar amount of habitat somewhere else in the same herd units, reducing disturbance between October 1 and November 30, etc.
2. Temporary suspension of drilling activity (not just pad construction and reclamation) to resolve human-grizzly bear conflicts should be included as a way to mitigate impacts on grizzlies.

3. Reclamation of disturbed areas should be accomplished through the use of native shrubs, forbs and grasses.

Wyoming Game and Fish Department information input and comment was also solicited for the preparation of the biological assessment for threatened and endangered species.

A scoping meeting for government agencies that might be affected by, or have an interest in, the action was held in the Worland District Office on September 27, 1983. The following agencies were notified of the meeting and invited to attend.

Park County Commission
Wyoming Department of Environmental Quality
Wyoming Oil and Gas Commission
Wyoming Game and Fish Department
Wyoming Highway Department
Wyoming State Planning Coordination Office
U.S. Fish and Wildlife Service
U.S. Forest Service (Shoshone National Forest)
National Park Service (Yellowstone National Park)

The APD was discussed and attendees were given a handout describing the scope of analysis, a general schedule and a response form. Written responses were received from six of the agencies. The responses received were generally helpful in defining issues and selecting mitigating measures.

PUBLIC PARTICIPATION

Opportunities for public participation were available throughout the EIS process. In August, 1983 a notice of intent to prepare an EIS and notice of a public scoping meeting appeared in the Federal Register. A news release was also issued statewide announcing the public meeting for the EIS.

On September 27, 1983 a scoping meeting for government agencies was held and on October 19 a public scoping meeting was conducted to identify additional issues. Issues identified by the public were received through December, 1983.

The first draft EIS was released and notice of availability was published in February, 1984. A February news release also announced the availability of the EIS and a March 21 public meeting on the EIS. This was followed in April by notices of open houses on April 30 and May 1, 1984 as well as a public hearing on May 2, 1984.

The public comment period for the first draft EIS was extended from 60 to 90 days based on public comment and a request from the Wyoming Congressional delegation. Comments received during that comment period prompted the BLM to prepare a second draft EIS which was filed with the EPA and released to the public in October, 1984.

A Federal Register notice of availability appeared in October, 1984. This notice also included a notice of a public hearing and open house on November 8, 1984. Another 60 day comment period followed. All letters and testimony were reviewed and considered.

REVIEW OF THE EIS

The following are some of the agencies, organizations, and individuals who were sent copies of the draft EIS for review:

Park County Planning Commission
Wyoming Department of Environmental Quality
Wyoming Oil and Gas Commission
Wyoming Game and Fish Department
Wyoming Highway Department
Wyoming State Planning Coordination Office
U.S. Fish and Wildlife Service
U.S. Forest Service (Shoshone National Forest)
National Park Service (Yellowstone National Park)

Foundation for North American Wild Sheep
Wyoming Heritage Society
Petroleum Association of Wyoming
Earth First

U.S. Representative Dick Cheney
U.S. Senator Alan K. Simpson
U.S. Senator Malcom Wallop

In addition, the document was distributed to the public-at-large on request.

The "Summary of Issues" section, below, summarizes the public input analysis.

The major issues identified during the public comment period are listed here. Following the list of comments on the second draft is a corresponding list of responses and a list of everyone who submitted comments to BLM, either by letter or at the November 8, 1984 public hearing. The concern of each respondent is represented by a number that corresponds to the following list of issues. Some of the respondents wrote more than one letter; however, each respondent is listed only once.

SUMMARY OF ISSUES FROM THE SECOND DRAFT EIS

General Comments on the Second Draft EIS

1. General comments against the project
2. General comments supporting the project
3. Better environmental review and evaluation should be done before the lease is issued.
4. The second draft offers more appropriate analysis than the first draft.
5. The "no action" alternative would not preclude all alternate location and access methods for APDs within the study area.
6. Additional issues and concerns were voiced at the October 19, 1983 scoping meeting.
7. Comment in favor of allowing drilling between June 21 and November 30.
8. An EIS was not necessary.
9. There is no verification plan to assure compliance of conditions of approval.
10. Portions of Appendix A are unreadable.
11. There are concerns about cumulative impacts associated with other non-energy projects.
12. A "delayed action" alternative should be considered.
13. The EIS does not give proper consideration of the deleterious affect that an oilfield or the drilling one well would have.
14. The wording is too vague concerning review under NEPA of additional APD's especially since the BLM has the habit of rubber stamping additional APDs with no additional review if the APD is considered to be substantially the same.
15. The draft EIS is inaccurate and inadequate.
16. The "no action" alternative is not a viable alternative.
17. The analysis of impacts to potential nonenergy mineral resources or mineral production facilities is inadequate.
18. Authority to require corrective action should be discussed.
19. If future analysis is necessary it should cover site specific and cumulative impacts of access, production, and development.
20. Marathon should design the production equipment for an earthquake with a maximum intensity of VII.
21. "No Action" would violate lease property rights.

Comments Related to Oil and Gas Development

22. The Oil and Gas Conservation Commission will insist on strict compliance with Rule 320-A dealing with blowout preventor equipment.
23. Sustained Yield Act of 1960 affects oil and gas development.
24. Approving one APD will lead to other oil and gas development.
25. The well casing procedure requires clarification.
26. There is a lack of contingency planning.
27. The Shoshone National Forest should define limits of oil and gas development in their Forest Management Plan.
28. The effects on subsequent lease rights should be addressed.
29. The area should not have been leased for oil and gas development.
30. Discussion of Oil and Gas development beyond the APD is not appropriate.
31. A hazardous spill contingency plan should be developed.
32. Marathon will operate in an environmentally responsible manner.
33. Impacts of field development should be done before approving this APD
34. Potential impacts of a total blowout should be analyzed.

Comments on Soils and Vegetation

35. The DEIS does not contain botanical information specific enough to warrant development.
36. The EIS did not consider the endangerment of an ecosystem that is essentially intact and in presettlement condition.

36a. Concern about slope stability possible failure.

Comments on Water

37. Waste water disposal and sanitation facilities should be addressed.

37a. Plans for the disposal of formation waters should be discussed.

38. There is no data base for stream flows.
39. Cutting and drilling fluids must be transferred to an approved disposal facility.

39a. Significant aquifers and their characteristics should be observed and noted during drilling.

40. Federal Flood Plain Management Criterion and permit requirements were stated.
41. The Proposed DEIS does not preclude development of the Shoshone Pipeline Municipal Project which is currently under study.

Comments on Air Quality

42. There is no data base for air quality.

Comments on Wildlife

43. The U. S. Fish and Wildlife Service's biological opinion concerning Threatened or Endangered species should be included in the EIS.
44. Wildlife maps and data are outdated and inconsistent.
45. There is no indication of concurrence by State Game managers.
46. Rig noise will not displace elk and bighorn sheep for a three mile radius.
47. The proposed site falls within critical grizzly bear habitat.
48. The EIS fails to adequately assess the risk to the grizzly posed by drilling operations and possible production activities.
49. Wildlife data is outdated and inaccurate.
50. Other wildlife species should be addressed.
51. Wildlife objective levels should be analyzed as well as big game seasonal movement and impacts on big game harvest.

Comments on Wilderness, Recreation, and Cultural Resources

52. Cultural impacts were not analyzed for Alternatives II and III.
53. Passage of The Wyoming Wilderness act of 1984 will cause the discussion of wilderness to change.
54. Executive Order 11593 and National Historic Protection Act of 1966 should be mentioned.
55. The mood of visitors that enter Yellowstone National Park via the east entrance could be adversely impacted.
56. Portions of the study area should be added to the wilderness system.
57. If archeological materials are discovered work will be halted and BLM and SHPO contacted. Archeological material must be evaluated and protected before work resumes.

Comments on Transportation

58. Intersections with well access roads would require acceleration and deceleration lanes, turning lanes, and through traffic lanes, as well as suitable signing on U. S. Highway 14/16/20.
59. Impacts due to exploratory drilling would be minor.

Comments on Socioeconomic Conditions

60. The effects on property values should be addressed.
61. The potential economic impacts on nearby private facilities should be addressed.
62. The economic analysis should emulate a profit and loss statement of a corporation; citing economic gains and losses to the immediate area.
63. The decline in oil and gas reserves and subsequent revenues from severance taxes should be considered.
64. A clearer picture of recent economic activity and effects should be presented.
65. There is no economic analysis.
66. Tourist, recreation, outfitter, and agriculture revenues are higher on the forest than oil/gas revenues.
67. Drilling personnel should be discouraged from taking up residence in Buffalo Bill State Park.

RESPONSE TO COMMENTS ON THE SECOND DRAFT

The following are responses to comments identified in the previous section.

1. No response necessary.
2. No response necessary.
3. Comment was noted.
4. No response necessary.
5. See text revisions concerning description of the "no action" alternative in Chapter I.
6. See text revisions in the Introduction section "Major Issues and Concerns."
7. Comment was noted.
8. Comment was noted. See Introduction describing the "Background."
9. See text revision in Chapter III. Introduction, regarding compliance inspections.
10. See text revisions in Appendix A.
11. These concerns includes other actions in the Shoshone National Forest, Yellowstone Park, and on private land. While there may be cumulative impacts, the USFS, National Park Service and other agencies reviewed the EIS to identify any threshold that would be exceeded by the alternatives in this EIS...
12. See text revision concerning "Alternatives Considered But Not Analyzed in Detail, Chapter I."
13. Opinion noted. The commentator gave no details on how to properly consider the effects.
14. Opinion noted. As deemed necessary pursuant to relevant law cumulative impacts of field developments will be addressed in subsequent analysis of specific proposed actions.
15. Opinion noted.
16. See description of Alternative 4, Chapter I.
17. See text revision in Chapter II. Affected Environment "Geology."
18. See text revisions to the Introduction to Chapter III, Environmental Consequences.
19. Comment noted. See response to comment 14.
20. This EIS focuses primarily on drilling since the APD does not address production. Concerns relating to production will be addressed in much more detail in subsequent environmental analysis if appropriate, e.g., technical standards will be identified and analyzed.
21. See description of Alternative IV in Chapter I.
22. Comment noted.
23. See text revision in the Introduction in Chapter I.
24. See Appendix E, "Development and Production of the Exploratory Well."
25. See description of Alternative I in Chapter I.
26. Marathon's APD for the North Fork Well contains adequate detail concerning support equipment, personnel capabilities, procedures, and supporting services.
27. The Shoshone National Forest plan is scheduled to be available in March of 1985.
28. See description of Alternative IV in Chapter I.
29. Opinion noted.
30. See Introduction to Appendix E.
31. As a condition of approval, Marathon would be required to develop a hazardous spill contingency plan which specifies how a spill would be contained, what equipment would be available for use and how the affected environment would be reclaimed.
32. Opinion noted.
33. See Introduction to Appendix E.
34. See discussion of geology and engineering for Alternative I in Chapter III, Environmental Consequences.
35. This may be true concerning development beyond one well; however, the botanist working on this project does not share this opinion concerning one well.
36. This EIS did not consider the impacts to the entire Yellowstone ecosystem because it was considered beyond the scope of this EIS due to the level of impacts identified in the environmental analysis.

36a. The proposed well site is on a relatively flat ridge top where slides are unlikely. Alternative III is located at the base of a slope in the Wapiti Formation where slope failure is possible.

37. See description of Alternative I in Chapter I.

37a. Disposal of formation water is a function of production and is beyond the scope of this EIS. Approval of the specific disposal method would require approval under Notice to Lessees (NTL2B). No method of disposal would be approved which would degrade surface or subsurface water quality. Any discharge to surface would require a permit from the Wyoming Department of Environmental Quality in addition to NTL2B approval from the BLM.

38. See Appendix G.
39. See text revision in discussion of Alternative I in Chapter I.

39a. One condition of approval for notice to drill is that the operator must report and protect all shows of fresh water. A sample must be taken of any water flows and furnished to the BLM.

40. Federal floodplain management criteria and permit requirements do not appear to apply to this action.
41. Comments noted.
42. Detailed air quality data is unavailable at this time; however, the analysis indicates that the air quality would not be affected unless an uncontrolled blowout occurred which is extremely unlikely. See Chapter III for a worst case analysis of a blowout.
43. See Appendix H.
44. See text revisions to the wildlife maps and narrative throughout the EIS.
45. See text revisions to the Consultation and Coordination Section of Chapter IV.
46. Opinion noted. However, noise is not the only thing that would cause the projected wildlife displacement.
47. See Appendix H.
48. See Appendix H.
49. See text revisions to wildlife maps and narrative throughout the EIS.
50. See text revision to discussion of Terrestrial Wildlife in Chapter II.
51. See text revisions to discussion of wildlife in Chapter III.
52. See text revisions to discussion of cultural impacts from Alternative II and III.
53. See text revision to discussion of Wilderness in Chapter II.
54. See text revisions to Introduction in Chapter I.
55. The overall analysis of drilling one well indicates this is unlikely unless a catastrophic event occurred.
56. Opinion noted. This is not the mandate of the Wyoming Wilderness Bill. See discussion of Wilderness in Chapter II (Affected Environment).
57. Comment noted. See text revision concerning cultural impacts in Chapter III.
58. See text revisions to recommend mitigation for Alternative I, II and III in Chapter III.
59. Opinion noted.
60. See text revision to socio economic impacts in Chapter III.
61. See text revision to socio economic impacts in Chapter III.
62. The economic analysis does not indicate any significant impacts to the local economy or to local economic trends from drilling one well. See text revisions to Appendix E.
63. See response to comment 62.
64. This is unnecessary since impacts to the local economy would be insignificant and would not effect recent economic trends.
65. See responses to comments 62 and 64.
66. Comment noted.
67. Concern noted; however, if this has been a problem when nearby wells were drilled, we are unaware of it.

LIST OF RESPONDENTS

State Agencies

Louis E. Allen, State Engineer's Office, Cheyenne, WY (53)
Donald B. Basko, State Oil and Gas Supervisor, Wyoming Oil and Gas Commission, Cheyenne, Wyoming (1,22)
Alvin F. Bastron, Wyoming Recreation Commission, Cheyenne, WY (67)
James C. Case, The Geological Survey of Wyoming, Laramie, WY (2,20)
E. J. Fanning, Wyoming DEQ, Water Quality Division(2,39)
Ed Herschler, Governor, State of Wyoming, Cheyenne, WY (19,22,31)
Mark Junge, Wyoming Recreation Commission, Cheyenne, WY (57)
William P. King, Environmental Services, Engineer, Wyoming State Highway Department, Cheyenne, Wyoming (58,59)
Al Likes, Wyoming Water Development Commission, Cheyenne, WY (41)
Francis Petera, Wyoming Game and Fish Department, Cheyenne, WY (7,43,44,48,51)

Federal Agencies

Arthur Anderson, USDI, Fish and Wildlife Service, Cheyenne, WY (19,33,43,44)
Kerrigan G. Clough, U. S. Environmental Protection Agency, Denver, CO (18,38,43,50)
James F. Devine, USDI, Geological Survey, Reston, VA(37,37a,39a)
Jimmie E. Jinks, USDI, Bureau of mines, Denver, CO (17)
Gerard E. Mick, Corps of Engineers, Department of the Army, Omaha, Nebraska(40,52)
Richard A. Strait, USDI, National Park Service, Denver, Colorado(27,43,55)
Richard H. Volmer, U. S. Nuclear Regulatory Commission, Washington, D. C.

National Societies

Mark Gordon, Sierra Club Northern Plains Regional Conservation Committee (1,10,15,19,34,49)
Thomas D. Lustig, National Wildlife Federation, Boulder, CO
Meredith Taylor, Wyoming Chapter Sierra Club(1,4,29,48,66)
W. E. Vehnekamp, Wyoming Wildlife Federation, Cody, WY (1,3,43,64)
Tom Wolf, The Nature Conservancy(4,35)

Industry

John D. Amen, Snyder Oil co., Denver, CO (2,4,21)
Roberta Andersen, Amoco Production Co., Denver, CO (2,4,6,7,8,23,28,43,53)

G. F. Dewhurst, Amerada Hess Corp., Tulsa, OK (2,4)
Wendy H. Frueauf, Petroleum Association of Wyoming, Casper, WY(2,4,8,43)
Charlie Mertz, Harper Oil Co., Denver, CO (2,7)
C. M. Moseley, Atlantic Richfield, Denver, CO(4,8,28,53)
Brad Penn, Marathon Oil Co, Casper, WY(2,4,7,8,16,32,46,53,59)
William E. Threlkeld, Geologist, Noranda Exploration, Denver, CO(8)
James M. Welch, Frontier Archaeology, Worland, WY(1,52,54)

Citizen's Groups and Organizations

Bob Anderson, Greater Yellowstone Coalition, Bozeman, MT (1,3,11,36,38,44,62)
Debra L. Beck, Wyoming Outdoor Council, Cheyenne, WY (1,4,24,33,36,47,48)
Robert W. Lichvar, Wyoming Native Plant Society, Cheyenne, WY (1,35)
Tony Povilitis, Campaign for Yellowstone's Bears, Boulder, CO (43,47,48)
Harry Roberts, Wyoming Heritage Society, Cody, WY(4,63,64)
Arne Sandberg, Park County Resource Council, Cody, WY(1,4,9,11,38,42,43,65)
Stan Siggens, Park County Resource Council, Cody, WY(1,9,10,11,12,19,25,26,27,29,38,42,43,44,45,62,65)

General Public

O. Clair Adams, Oil & Gas Exploration Consultants, Salt Lake City, Utah(2,5,7)
Judy K. Andre, Denver, CO(2,7)
Pam Armstrong, Denver, CO (2,7)
Lon Binnicker, Denver, CO (2,7)
Dave Brogonier, Cody, WY (1,4,29,44)
Debbie Bright, Denver, CO (2,7)
David J. Cason, Denver, CO (2,7)
Lynn Chadwick, D.V.S., Cody, WY (1,44)
Tami Cozzens, Cody, WY(1)
Inez A. Crawshaw, Denver, CO (2,7)
David K. Davenport, Casper, WY (4,7,10)
Jeffrey C. Delaney, Denver, CO (2,7)
Larry D. Brito, Chicago, IL (1)
Duncan Edwards, Denver, CO (2,7)
Erwin F. Everet, Park Ridge, IL (3,29,35,36,56)
JoAnna Goddard, Denver, CO (2,7)
William F. Graf, Evergreen, CO (2,7)
Karen Harris, Denver, CO (2,7)
Barbara Hassler (1)
Debbie Hathhorn, Westminster, CO (2,7)
John Hickenlooper, Denver, CO (2,7)
Paul & Lisa Hoffman, Cody, WY (1,4,14,15,26,38,43,44,65)
James G. Hohenstein, Denver, CO (2,7)
David E. Hutchison, Denver, CO (2,7)
Clifford A. Kaufman, Powell, WY (1)
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Chris Kennedy, Denver, CO (2,7)
Gene Klapel, Denver, CO (2,7)
Shiela Koppenheffer, Denver, CO (2,7)
Kelly J. Krattenmaker, Denver, CO (2,7)
Debra Kurtenbach, Denver, CO (2,7)
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Joyce Maser, Denver, CO (2,7)
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Leonard Moore, Cody, WY (1)
Robert P. Munn, Denver, CO. (2,7)
Catherine M. Murphy, Denver, CO (2,7)
Dan Nelipovich, Denver, CO (2,7)
Jennifer Hunt Nelson, Lakewood, CO (2,7)
Frank B. Odasz, Casper, WY (7)
Mary Rae Pacheco, Denver, CO (2,7)
Kathryn Portus, Denver, CO (2,7)
Delilah Ratcliff, Powell, WY (1)
Elmer Ratcliff, Powell, WY (15,29)
R. K. Reynolds, Aurora, CO (2,7)
Normal Rutledge, Denver, CO (2,7)
Arne G. Sandberg, Cody, WY (1,26,38,42,46,65)
June Sandberg, Cody, WY (1,60)
Pamela A. Schmidt, Denver, CO (2,7,)
Ceci Searls, Denver, CO (2,7)
Eric Simons, Denver, CO (2,7)
Rose H. Slak, Denver, CO (2,7)
Irene B. Smith, Cody, WY (1,24)
Rod Smith, Denver, CO (2,7)
Joyce Soles, Cody, WY (1)
Cindy J. Staudt, Denver, CO (2,7)
Ernest F. Stone, Wapiti, WY (1,13,26,31,60)
John R. Swanson, Berkeley, CA (1,56)
Diane Szymkowicz, Denver, CO (2,7)
Eldon E. Tanner, Denver, CO (2,7)
Robert & Nanette Till, Rocking T Ranch, Azle, TX (1)
Lester Tuttle, Washington, KS (1)
Joe Velehradsky, Powell, WY (1)
Ken Vigil, Denver, CO (2,7)
Michael E. Ward, Denver, CO (2,7)
Jerry Williams, Denver, CO (2,7)
A. C. Woods, Longview, TX (3)

GLOSSARY

Words in italics are also defined in this Glossary.

ACCELERATED EROSION RATE. (1)Erosion that can be attributed directly or indirectly to human activities; (2) Erosion much more rapid than normal erosion, natural erosion or geologic erosion occurring primarily as a result of the influence of human activities or, in some cases, of other animals or natural catastrophes that expose the bare soil surface.

ADT. Average Daily Traffic.

AIR/MIST SYSTEM. Drilling with and air-water mixture instead of drilling fluid. This system results in fast drilling rates in dry, stable formations with low pore pressure and permeability. Also see *Chem-gel System.*.

AGGRADATION. A condition of disequilibrium in a stream in which more sediment is deposited than can be removed. The opposite condition is one of degradation.

AGGREGATE SOURCE. A source of crushed or screened rock for use as road surfacing material.

ALLUVIUM. Material such as clay, silt, sand, gravel, and mud deposited in riverbeds, lakes, alluvial fans, valleys and elsewhere by modern streams. Accumulations are referred to as alluvial lands.

ANTIQUITIES PERMIT. A permit that allows on-the-ground surveys and curation by qualified individuals or groups.

AQUIFER. A geologic formation or structure that transmits water in sufficient quantity to supply the needs for a water development such as a well. The term "water-bearing" is sometimes used synonymously with "aquifer" when a stratum furnishes water for a specific use. Aquifers are usually saturated sands, gravel, fractured rock, or cavernous and vesicular rock.

BACKGROUND. Area located from 3 to 5 miles to infinity from the viewer.

BEDLOAD. Material stored in a streambed that is capable of being transported under certain conditions of flow, such as during the annual peak discharge.

BENEFICIAL USE. A use of waters of the state that may be protected against quality degradation, including, but not necessarily limited, to domestic, municipal, agricultural, and industrial supply; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

BEST MANAGEMENT PRACTICE. A practice, or a combination of practices, that is determined by a state or a designated area-wide planning agency, after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

BLOOIE PIT. A pit dug at the end of a pipeline that is used to contain the cuttings and dust encountered in air drilling.

BRAIDED FLOODWAY. A relatively wide stream or riverbed composed predominantly of rock, gravel, and silt, containing several channels that cross each other in a braid-like pattern.

CARRYING CAPACITY. The maximum number of animals a given area can support during a year, or which can be maintained on a given date.

CHARACTERISTIC LANDSCAPE. The naturally established landscape within a scene or scenes being viewed.

CHEM-GEL SYSTEM. Drilling with drilling mud to which chemicals have been added to enhance the properties of the mud. Also see *Air/Mist System.*

CLASS II WATER QUALITY. See *Water Quality Standards.*

COLLUVIUM. Mixed deposits of soil material and rock fragments accumulated near the base of steep slopes through soil creep, landslides, and local surface runoff. Accumulations are referred to as colluvial slopes.

CUMULATIVE IMPACTS. The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (regulations of the Council on Environmental Quality).

DEGRADATION. A condition of disequilibrium in a stream in which more sediment is removed than is deposited. This condition is characterized by downcutting and channel back erosion and is similar to gully development.

DISTANCE ZONES. Areas of landscapes denoted by specified distances from the observer. Used as a frame of reference in which to discuss landscape characteristics or human activities.

EASEMENT. A right that one may have on another's land. In the petroleum "easement" industry usually refers to the right given by a landowner for a pipeline to be laid across his or her land.

EPHEMERAL CHANNEL. A channel that carries water briefly in response to storm events or runoff from snowmelt. (Also see *Intermittent Stream* and 2Perennial Stream.)

EQUILIBRIUM. As applied to a stream system, a condition of balance between the stream's sediment load and its ability to transport the sediment. The stream has "adjusted" to any significant changes affecting its regime. Use of the term is not meant to imply a condition of stability in regard to local reaches of stream channel.

FAVORABLE CONDITIONS OF FLOW. Initial legislation mandating uses of National Forest System lands. The Organic Act of 1897 stated as a major purpose the provision of favorable conditions of flow. This has recently been interpreted by professionals in hydrology, and accepted through adjudication, as maintenance of flow regimen by providing sufficient quantities of water instream.

FLOOD. An unusually high accumulation or runoff of surface waters.

FLOODPLAIN. The portion of a stream valley adjacent to the channel that is built of sediments during its present regime (that is, the state of equilibrium between a stream and its ability to transport sediments), and which is covered with water when the stream overflows its banks at flood stages.

FLOODWAY. The portion of a floodplain that is mostly devoid of rooted vegetation and is expected to be covered by an annual peak flow.

FLOW REGIME (Regimen). The system or order characteristic of a stream; in other words, its habits with respect to velocity and volume, form, and changes in channel, capacity to transport sediment, and amount of material supplied for transportation. The term is also applied to a stream which has reached an equilibrium between corrosion and deposition or, in other words, to a graded stream.

GLOSSARY

FOREGROUND. The detailed landscape found between 1 mile and 1/2 mile from the observer.

FOREST DEVELOPMENT ROADS AND TRAILS. A forest road or trail under the jurisdiction of the Forest Service.

FOREST ROAD OR TRAIL. A road or trail wholly or partly within, or adjacent to, and serving the National Forest System and which is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

FROST HEAVING. The pushing up of a surface by the accumulation of ice in the underlying soil. The freeze-thaw phenomenon refers to repeated episodes of frost heaving, which result in continual movement of the soil surface.

GABION. A basket of wicker or metal filled with earth and stones.

HYDROGRAPH. Distribution of runoff or surface flows through time.

HYDROLOGIC REGIME. See *Flow Regime.*

HYDROLOGIC UTILITY. A reference from Executive Order 11990, Floodplain Management. This is considered to be equivalent to *Hydrologic Regime* or *Flow Regime* in regard to a stream in *equilibrium.*

INTENSITY. A qualitative measure of the degree of shaking an earthquake incurs on people, structures, and the ground. The most widely used scale is the modified Mercalli Scale, which is written in Roman Numerals. The North Fork Well is in an area that could experience an earthquake of intensity V to VII, which are described below: (Realize that intensities can vary depending on the distance from the epicenter.)

V. Felt by nearly everyone; many awaken. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturn. Disturbance of trees, poles and other tall objects sometimes noticed. Pendulum clocks may stop.

VI. Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.

VII. Everybody runs outdoors. Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.

INTERMITTENT STREAM. A stream or portion of a stream whose channel bed lies below the local water table for a portion of the year. As the water table falls during drier seasons, flows decline and eventually cease. The stream may flow most of the year, or for only a brief time. (Also see *Ephemeral Channel* and *Perennial Stream.*)

LANDFORM. (1) Term used to describe the many types of land surfaces that exist as a result of geological activity, such as plateaus, plains, basins, mountains; (2) A feature of the earth's surface with distinctive form characters that can be attributed to the dominance of particular processes of particular structures in the course of its development and to which the feature can be clearly related.

LANDSCAPE ELEMENT. The four basic items that make up a landscape: form, line, color, and texture.

LISTED SPECIES. Any species of fish, wildlife, or plant that is designated as endangered or threatened under the Endangered Species Act. These species are considered officially listed when so designated in the *Federal Register.*

MASS FAILURE. The downward slipping of a rock mass or unconsolidated earth material. Unstable mass moves as a unit or as several separate units, usually with a backward rotation.

MAXIMUM MODIFICATION. Term used for the prediction of visual quality where human activities dominate the landscape but appear as a natural occurrence when viewed as background.

MINIMUM INSTREAM FLOW. The quantities of flow that are judged sufficient to maintain favorable conditions in the channel, or stable *Hydrologic Regime.* Also referred to as the streamflow necessary to maintain ecosystem values, fish habitat, aesthetics, wildlife or livestock use, recreation, navigation, or other uses dependent on instream flow.

MITIGATE. To offset or lessen real or potential impacts of actions through the application of additional controls or actions. Mitigating measures are countermeasures employed to reduce or eliminate undesirable or unwanted results.

MIXING ZONE. A region in which an effluent (pollutant) is in transit from the outfall source of the receiving waters. The effluent is progressively diluted, but its concentration is higher than in the receiving waters.

MODIFICATION. A term used for the prediction of visual quality where human activities dominate the landscape, but at the same time use naturally established form, line, color, and texture.

NATURAL EROSION RATE. The rate at which the earth's surface is worn away by natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by human activity.

MAGNITUDE A measure of the strength of an earthquake recorded by a seismograph. The most famous magnitude scale is the Richter Scale which is written in Arabic Numerals.

NON-POINT SOURCE POLLUTION. Pollution whose source is general rather than specific in location. It is widely used in reference to agricultural and related pollutants. For example, production of sediment from road systems where no point source can be identified. (See also *Point Source Pollution, Best Management Practice,* and *Water Quality Standards.*)

OFF-SITE IMPACTS. Secondary impacts; the impacts that occur as a result of an operation or event physically located elsewhere. Specifically, impacts that occur downstream from oil and gas operations.

PARTIAL RETENTION. A term used for the prediction of visual quality where human activities are evident but remain subordinate to the characteristic landscape.

PEAK FLOW. The greatest quantity of flow or discharge carried by a steam during a given period of time (for example, annual peak).

PERENNIAL STREAM. Streams that flow throughout the year and from source to mouth. The channel bed lies below the local water table throughout the average water year. (Also see *Ephemeral Channel* and *Intermittent Stream.*)

POACH. To take fish or game illegally.

POINT SOURCE POLLUTION. Pollution whose source is specific rather than general in location. For example, particulate matter emanating from a specific smokestack, or sediment entering a stream from a specific bridge construction site. (Also see *Nonpoint Source Pollution.*)

PRIMITIVE. A term used to classify recreation opportunities where human activities create or maintain a predominantly unmodified natural environment. The sights or sounds of human activities are not evident. Motorized use does not occur in or near the area.

RECREATION RESPONSE UNIT. A combination of recreation resource inventory items that respond to human activities in a similar fashion.

RECREATION VISITOR DAY (RVD). An aggregate of 12 hours of use; it may consist of one person's use for 12 hours or 12 people's use for one hour, or any equivalent combination.

RESTORATION. The act of returning a physically disturbed site to the physical condition that existed before disturbance. Road, pad, and pipeline construction generally requires excavation and fill. Restoration specifically refers to the act of returning these sites to their original surface configuration. Restoration potential ratings are defined below.

good restoration potential rating indicates that the physical properties of a site are favorable to allow restoration of the surface configuration; that is, soil depth, slope, soil texture class, and surface shape are such that the land surface configuration can easily be reconstructed.

fair restoration potential rating indicates that the physical properties of a site are such that 50 to 90 percent of the original surface configuration can be restored.

poor restoration potential rating indicates that the physical properties of the site are such that less than 50 percent of the original surface configuration can be restored.

RETENTION. A term used for the prediction of visual quality where human activities are not visually evident.

REVEGETATION. The act of returning a biologically disturbed site to the vegetative conditions that existed before disturbance. Revegetation potential ratings are described below.

good revegetation potential rating indicates that the physical properties of the site are such that following restoration, the site can be revegetated successfully to at least its original plant density. It also indicates that the site is capable of going through stages of plant succession to its natural vegetative climax.

fair revegetative potential rating indicates that the physical properties of the site are such that following restoration, the site can be revegetated to 50 to 90 percent of its original plant density. It also indicates that the site is so severely altered that plant succession to climax will be considerably lengthened over natural time frames.

poor revegetation potential rating indicates that the physical properties of the site are such that following restoration, the site can only be revegetated to less than 50 percent of its original plant density. It also indicates that the site is so severely altered that it is doubtful that plant succession will continue through to the original natural vegetation climax that existed before disturbance.

RIPARIAN-AQUATIC ECOSYSTEM. A combination of the ecosystems associated with stream channels, lake beds, surface water itself, and the adjacent land area that is characterized by vegetation requiring free or unbound water. "Riparian area" is a cover term that is meant to encompass the riparian-aquatic ecosystem, including floodplains and wetlands. Dependent resources are those that owe their existence to riparian areas. Riparian zones are delineated as the land and vegetation extending at least 100 feet horizontally from the edges of all lakes and perennial streams.

RIPARIAN ECOTONE. See *Riparian-Aquatic Ecosystem.*

RIPARIAN AREA DEPENDENT RESOURCES. See *Riparian-Aquatic Ecosystem.* Examples are water and its prevalent quality, fisheries, wildlife, and vegetation. These resources are to be protected in the event of a conflict with other uses, according to Forest Service Manual 2500.

RIPARIAN ZONE. The land and vegetation extending at least 100 feet horizontally from the edges of all lakes and perennial streams. Delineation is directed by Forest Service Manual 2500.

ROAD. A general term denoting a way for purposes of travel by vehicles greater than 40 inches in width.

ROADED NATURAL. A term used to classify recreation opportunities where human activities create an environment with moderate evidences of the sights and sounds of people. Such evidences may harmonize with the natural environment. Some facilities for motorized use are present.

RURAL. A term used to predict recreation opportunities where human activities create an area or site that is characterized by a culturally modified environment. Sights and sounds of humans are highly evident. Facilities for intensified motorized use are present.

SECTION 404 PERMIT. Section 404 of the Water Pollution Control Act of 1972 (P. L. 92-500), as amended by the Clean Water Act of 1977, requires the Corps of Engineers to issue permits for the disposal of dredge and fill material in navigable waters.

SEMI-PRIMITIVE MOTORIZED. A term used to classify recreation opportunities where human activities create or maintain an area or site that is characterized by an essentially unmodified natural environment. Facilities are provided for challenging motorized experiences.

SEMI-PRIMITIVE NONMOTORIZED. A term used to classify recreation opportunities where human activities create or maintain an area or site that is characterized by an essentially unmodified natural environment. Motorized use in the area is prohibited.

SENSITIVITY LEVEL. A measurement of people's concern for scenic quality.

SOIL PRODUCTIVITY. The ability of a soil to maintain a physical, chemical, and biological condition sufficient to support optimal vegetative growth.

SOLIFLUCTION. The slow downslope movement of soil resulting from alternating periods of freeze and thaw or a continually saturated soil condition. **STREAM ORDER.** Using a channel network map, including all intermittent and permanent flow lines located in clearly defined valleys, the smallest fingertip tributaries are designated "order 1." Where two first order channels join, a channel segment of "order 2" is formed; where two or more "order 2" join, a segment of "order 3" is formed; and so forth.

SUBORDINATE. Inferior to another in size, brightness, etc.; secondary in visual impact.

SUBSURFACE RECHARGE. The portion of precipitation that percolates through the soil matrix and mantle to replenish subsurface water-bearing structures.

SURFACE RECHARGE. The portion of precipitation that percolates into relatively shallow water tables (as in riparian wetlands) and provides for maintenance of surface flow in adjacent stream channels. Hillslope water maintains or replenishes streamflows by hydraulic pressures exerted through the soil matrix. See also *Perennial Stream.*

TURBIDITY. An optical property of sediment suspended in water, turbidity is measured according to the propensity of sediment to scatter light that is projected through a sample. Very turbid water may be aesthetically displeasing, is a barrier to fish, hinders fishing recreation,, and is unpalatable. Sediment, as indicated by turbidity measurement, can have pervasive effects throughout an aquatic ecosystem.

VALLEY INNER GORGE. A landform consisting of incised (deeply cut) valleys with slopes standing at or near the effective angle of repose. Inner gorges are prone to failure under extreme, naturally occurring events and under the influence of human activities. Failure of inner gorge side slopes contributes soil, rock, and organic debris directly into stream channels, causing a self-sustaining cycle of on-site and off-site effects. The margin of a valley inner gorge can usually be identified as the first sharp break in slopes above a stream channel. This landform concept was applied to the study area and is the basis for determination of *Severe Watershed Hazard Zones.*

VARIETY CLASS. A particular level of visual variety or diversity of a landscape. The classes are defined below.

Class A (Distinctive). Features of landform, vegetative patterns, water forms, and rock formation are of unusual or outstanding visual quality.

Class B (Common). Landscape features contain variety in form, line, color, and texture or combinations thereof, but they tend to be common throughout a landscape.

Class C (Minimal). Features have little change in form, line, color, or texture. Includes all areas not found under Class A and B.

VIEWSHED. The portion of landscape that falls within a person's cone of vision.

VISUAL ABSORPTION CAPABILITY. A measurement of the landscape's potential to accept alterations without significant loss of natural landscape character.

VISUAL MANAGEMENT COMPONENTS - Those inventory items that are used to analyze and estimate effects of human activities on the visual resource.

VISUAL RESPONSE UNIT. Combinations of visual management components that respond to human activities in a similar fashion.

WATER QUALITY STANDARDS. Standards prescribed and enforced by the Wyoming DEQ under the authority of the Clean Water Act and the Wyoming Environmental Quality Act. Surface waters are categorized as Classes I, II, III, and IV; standards are class specific. Class II standards are applied to streams that are capable of or are now supporting game fish. Control of existing or threatened nonpoint source pollution requires the development and implementation of *Best Management Practices.*

WATER TABLE. The underground level at which water is found. This term is often used in connection with underwater supplies used for irrigation and industrial plants, and it can be used to designate the top of the drilling derrick, which supports the crown block.

WETLANDS. Areas that are inundated by surface water or groundwater with a frequency sufficient to support, and which normal circumstances does or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. The term "wetlands" generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

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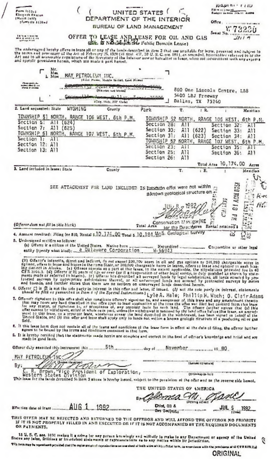
APPENDIX A

OFFER TO LEASE AND LEASE FOR OIL AND GAS



Form 3110-1
Eleventh Edition
(March 1977)
(formerly 3120-1)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Wapiti - Fld

Form approved.

Office .....

Serial No. W73230

OFFER TO LEASE AND LEASE FOR OIL AND GAS
(Sec. 17 Noncompetitive Public Domain Lease)

The undersigned hereby offers to lease all or any of the lands described in item 2 that are available for lease, pursuant and subject to the terms and provisions of the Act of February 25, 1920 (41 Stat. 437, 30 U. S. C. sec. 181), as amended, hereinafter referred to as the Act and to all reasonable regulations of the Secretary of the Interior now or hereafter in force, when not inconsistent with any express and specific provisions herein, which are made a part hereof.

1. Mr. Mrs. Miss MAY PETROLEUM INC.
(First Name, Middle Initial, Last Name)
~~[illegible]~~
(Number and Street)
~~[illegible]~~
(City, State, ZIP Code)

800 One Lincoln Centre, LB8
5400 LBJ Freeway
Dallas, TX 75240

2. Land requested: State WYOMING County Park T. R. Meridian

TOWNSHIP 51 NORTH, RANGE 106 WEST, 6th P.M.
Section 6: All (624)
Section 7: All (625)

TOWNSHIP 51 NORTH, RANGE 107 WEST, 6th P.M.
Section 1: All
Section 12: All
Section 13: All

TOWNSHIP 52 NORTH, RANGE 106 WEST, 6th P.M.
Section 28: All
Section 30: All (622)
Section 31: All (623)
Section 32: All
Section 33: All
Section 34: All

TOWNSHIP 52 NORTH, RANGE 107 WEST, 6th P.M.
Section 23: All
Section 25: All
Section 26: All
Section 35: All
Section 36: All

Total Area 10,174.00 Acres

3. Land included in lease: State County T. R. Meridian

SEE ATTACHMENT FOR LAND INCLUDED IN ~~lease~~ Lands in offer were not within a known geological structure on JUL 8 1982

Acting Deputy
Conservation Manager/RE
for the Director
U.S. Geological Survey

1980 NOV 18 PM

(Offeror does not fill in this block) Total Area Acres Rental retained $

4. Amount remitted: Filing fee $10, Rental $ 10,174.00 Total $ 10,184.00

5. Undersigned certifies as follows:

(a) Offeror is a citizen of the United States. Native born ..... Naturalized ..... Corporation or other legal entity (specify what kind): a Delaware Corporation W-56943

(b) Offeror's interests, direct and indirect, do not exceed 200,000 acres in oil and gas options or 246,080 chargeable acres in options, offers to lease and leases in the same State, or 300,000 chargeable acres in leases, offers to lease and options in each leasing district in Alaska. (c) Offeror accepts as a part of this lease, to the extent applicable, the stipulations provided for in 43 CFR 3101.2. (d) Offeror is 21 years of age or over (or if a corporation or other legal entity, is duly qualified as shown by statements made or referred to herein). (e) Offeror has described all surveyed lands by legal subdivisions, all lands covered by protracted surveys by appropriate subdivisions thereof, or all unsurveyed lands not covered by protracted surveys by metes and bounds, and further states that there are no settlers on unsurveyed lands described herein.

6. Offeror ☐ is ☒ is not the sole party in interest in this offer and lease, if issued. (If not the sole party in interest, statements should be filed as prescribed in Item 6 of the Special Instructions.) Lyle A. Hale; Phillip H. Wach; O. Clair Adams

7. Offeror's signature to this offer shall also constitute offeror's signature to, and acceptance of, this lease and any amendment thereto that may cover any land described in this offer open to lease application at the time the offer was filed but omitted from this lease for any reason, or signature to, or acceptance of, any separate lease for such land. The offeror further agrees that (a) this offer cannot be withdrawn, either in whole or in part, unless the withdrawal is received by the land office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed in behalf of the United States, and (b) this offer and lease shall apply only to lands not within a known geologic structure of a producing oil or gas field.

8. If this lease form does not contain all of the terms and conditions of the lease form in effect at the date of filing, the offeror further agrees to be bound by the terms and conditions contained in that form.

9. It is hereby certified that the statements made herein are complete and correct to the best of offeror's knowledge and belief and are made in good faith.

Offeror duly executed this instrument this 5th day of November 19 80

MAY PETROLEUM INC.
(Lessee Signature)
By:
C. R. Brown, Vice President of Exploration, Western States Division

(Lessee Signature)

(Attorney-in-fact)

This lease for the lands described in item 3 above is hereby issued, subject to the provisions of the offer and on the reverse side hereof.

THE UNITED STATES OF AMERICA

By Glenna M. Lance
(Signing officer)

Effective date of lease AUG 1 1982

Chief, Oil & Gas Section
(Title)

JUL 9 1982
(Date)

THIS OFFER MAY BE REJECTED AND RETURNED TO THE OFFEROR AND WILL AFFORD THE OFFEROR NO PRIORITY IF IT IS NOT PROPERLY FILLED IN AND EXECUTED OR IF IT IS NOT ACCOMPANIED BY THE REQUIRED DOCUMENTS OR PAYMENTS.

18 U. S. C. sec. 1001 makes it a crime for any person knowingly and willfully to make to any Department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

This form may be reproduced provided that the copies are exact reproductions on one sheet of both sides of this official form, in accordance with the provisions of 43 CFR 3111.1(a)

ORIGINAL

Note:

Because of readability, the standard lease language shown here has been enlarged to a readable size and inserted on the following pages.

APPENDIX A

SECTION 1. Rights of lessee. The lessee is granted the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits, except helium gas, in the lands leased, together with the right to construct and maintain thereupon, all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof, for a period of 10 years, and so long thereafter as oil or gas is produced in paying quantities; subject to any unit agreement heretofore or hereafter approved by the Secretary of the Interior, the provisions of said agreement to govern the lands subject thereto where inconsistent with the terms of this lease.

SEC. 2. The lessee agrees:

(a) Bonds--(1) To file any bond required by this lease and the current regulations and until such bond is filed not to enter on the land under this lease. (2) To maintain any bond furnished by the lessee as a condition for the issuance of this lease. (3) To furnish a bond in a sum double the amount of $2 per acre annual rental, but not less than $1,000 nor more than $10,000, upon the inclusion of any part of the leased land within the known geologic structure of a producing oil or gas field. (4) To furnish prior to beginning of drilling operations and maintain at all times thereafter as required by the lessor a bond in the penal sum of $10,000 with approved corporate surety, or with deposit of United States bonds as surety therefor, conditioned upon compliance with the terms of this lease, unless a bond in that amount is already being maintained or unless such a bond furnished by an operator of the lease is accepted. (5) Until a general lease bond is filed to furnish and maintain a bond in the penal sum of not less than $1,000 in those cases in which a bond is required by law for the protection of the owners of surface rights. In lieu of any of the bonds described herein, the lessee may file such other bond as the regulations may permit.

(b) Cooperative or unit plan.--Within 30 days of demand, or, if the leased land is committed to an approved unit or cooperative plan and such plan is terminated prior to the expiration of this lease, within 30 days of demand made thereafter, to subscribe to and to operate under such reasonable cooperative or unit plan for the development and operation of the area, field, or pool, or part thereof, embracing the lands included herein as the Secretary of the Interior may then determine to be practicable and necessary or advisable, which plan shall adequately protect the rights of all parties in interest including the United States.

(c) Wells.--(1) To drill and produce all wells necessary to protect the leased land from drainage by wells on lands not the property of the lessor, or lands of the United States leased at a lower royalty rate, or as to which the royalties and rentals are paid into different funds than are those of this lease; or in lieu of any part of such drilling and production, with the consent of the Director of the Geological Survey, to compensate the lessor in full each month for the estimated loss of royalty through drainage in the amount determined by said Director; (2) at the election of the lessee, to drill and produce other wells in conformity with any system of well spacing or production allotments affecting the field or area in which the leased lands are situated, which is authorized and sanctioned by applicable law or by the Secretary of the Interior; and (3) promptly after due notice in writing to drill and produce such other wells as the Secretary of the Interior may reasonably require in order that the leased premises may be properly and timely developed and produced in accordance with good operating practice.

(d) Rentals and royalties.--(1) To pay rentals and royalties in amount or value of production removed or sold from the leased lands as follows:

Rentals. To pay the lessor in advance an annual rental at the following rates:

(a) If the lands are wholly outside the known geologic structure of a producing oil or gas field:
   (i) For each lease year a rental of $1.00 per acre or fraction of an acre.

(b) If the lands are wholly or partly within the known geologic structure of a producing oil or gas field:
   (i) Beginning with the first lease year after 30 days' notice that all or part of the land is included in such a structure and for each year thereafter, prior to a discovery of oil or gas on the lands leased, $2 per acre or fraction of an acre.
   (ii) If this lease is committed to an approved cooperative or unit plan which includes a well capable of producing oil or gas and contains a general provision for allocation of production, the rental prescribed for the respective lease years in subparagraph (a) of this section, shall apply to the acreage not within a participating area.

Minimum royalty.--Commencing with the lease year beginning on or after a discovery on the leased land, to pay the lessor in lieu of rental, a minimum royalty of $1 per acre or fraction thereof at the expiration of each lease year or the difference between the actual royalty paid during the year if less than $1 per acre, and the prescribed minimum royalty of $1 per acre, provided that if this lease is unitized, the minimum royalty shall be payable only on the participating acreage and rental shall be payable on the nonparticipating acreage as provided in subparagraph (b) (ii) above.

Royalty on production. To pay the lessor $12^{1}/_{2}$ percent royalty on the production removed or sold from the leased lands computed in accordance with the Oil and Gas Operating Regulations (30 CFR Pt. 221).

(2) It is expressly agreed that the Secretary of the Interior may establish reasonable minimum values for purposes of computing royalty on any or all oil, gas, natural gasoline, and other products obtained from gas, due consideration being given to the highest price paid for a part or for a majority of production of like quality in the same field, to the price received by the lessee, to posted prices, and to other relevant matters and, whenever appropriate, after notice and opportunity to be heard.

(3) When paid in value, such royalties on production shall be due and payable monthly on the last day of the calendar month next following the calendar month in which produced. When paid in amount of production, such royalty products shall be delivered in merchantable condition on the premises where produced without cost to lessor, unless otherwise agreed to by the parties hereto, at such times and in such tanks provided by the lessee as reasonably may be required by the lessor, but in no case shall the lessee be required to hold such royalty oil or other products in storage beyond the last day of the calendar month next following the calendar months in which produced nor be responsible or held liable for the loss or destruction of royalty oil or other products in storage from causes over which he has no control.

(4) Rentals or minimum royalties may be waived, suspended, or reduced and royalties on the entire leasehold or any portion thereof segregated for royalty purposes may be reduced if the Secretary of the Interior finds that, for the purpose of encouraging the greatest ultimate recovery of oil or gas and in the interest of conservation of natural resources, it is necessary, in his judgment to do so in order to promote development, or because the lease cannot be successfully operated under the terms fixed herein.

(e) Payments.--Unless otherwise directed by the Secretary of the Interior to make rental, royalty, or other payments to the lessor, to the order of the Bureau of Land Management at the places mentioned in the regulation 43 CFR 3102.2. If there is no well on the leased lands capable of producing oil or gas in paying quantities, the failure to pay rental on or before the anniversary date shall automatically terminate the lease by operation of law. However, if the time for payment falls on a day in which the proper office to receive payment is closed, payment shall be deemed timely if made on the next official working day.

(f) Contracts for disposal of products.--To file with Oil and Gas Supervisor of the Geological Survey not later than 30 days after the effective date thereof any contract, or evidence of other arrangement, for the sale or disposal of oil, gas, natural gasoline, and other products of the leased land: *Provided*, That nothing in any such contract or other arrangement shall be construed as modifying any of the provisions of this lease, including, but not limited to, provisions relating to gas waste, taking royalty in kind, and the method of computing royalties due as based on a minimum valuation and in accordance with the Oil and Gas Operating Regulations.

(g) Statements, plats and reports.--At such times and in such form as the lessor may prescribe, to furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost, a plat showing development work and improvements in the leased lands; and a report with respect to stockholders, investments, depreciation and costs.

(h) Well records.--To keep a daily drilling record, a log, and complete information on all well surveys and tests in form acceptable to or prescribed by the lessor of all wells drilled on the leased lands, and an acceptable record of all subsurface investigations affecting said lands, and to furnish them , or copies thereof, to the lessor when required. All information obtained under this paragraph, upon the request of lessee, shall not be open to inspection by the public until the expiration of the lease.

(i) Inspection.--To keep open at all reasonable times for the inspection of any duly authorized officer of the Department, the leased premises and all wells, improvements, machinery, and fixtures thereon and all books, accounts, maps and records relative to operations and surveys or investigations on the leased lands or under the lease. All information obtained pursuant to any such inspection, upon the request of the lessee, shall not be open to inspection by the public until the expiration of the lease.

(j) Diligence, prevention of waste, health and safety of workmen.--To exercise reasonable diligence in drilling and producing the wells herein provided for unless consent to suspend operations temporarily is granted by the lessor; to carry on all operations in accordance with approved methods and practice as provided in the Oil and Gas Operating Regulations, having due regard for the prevention of waste of oil or gas or damage to deposits or formations containing oil, gas, or water or to coal measures or other mineral deposits, for conservation of gas energy, for the preservation and conservation of the property for future productive operations, and for the health and safety of workmen and employees; to plug properly and effectively all wells drilled in accordance with the provisions of this lease or of any prior lease or permit upon which the right to this lease was predicated before abandoning the same; to carry out at expense of the lessee all reasonable orders of the lessor relative to the matters in this paragraph, and that on failure of the lessee so to do the lessor shall have the right to enter on the property and to accomplish the purpose of such orders at the lessee's cost: *Provided*, That the lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(k) Taxes and wages, freedom of purchase.--To pay when due, all taxes lawfully assessed and levied under the laws of the State or the United States upon improvements, oil and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(l) Equal Opportunity clause.--During the performance of this contract the lessee agrees as follows:

(1) The lessee will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The lessee will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such actions shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The lessee agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The lessee will, in all solicitations or advertisements for employees placed by or on behalf of the lessee, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

(3) The lessee will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the lessee's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The lessee will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the lessee's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the lessee may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulations or order of the Secretary of Labor, or as otherwise provided by law.

(7) The lessee will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The lessee will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: *Provided, however*, That in the event the lessee becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the lessee may request the United States to enter into such litigation to protect the interests of the United States.

APPENDIX A

(m) Assignment of oil and gas lease or interest therein.--As required by applicable law, to file for approval by the lessor any instrument of transfer made of this lease or any interest therein, including assignments of record title, operating agreements and subleases, working or royalty interests, within 90 days from the date of final execution thereof.

(n) Pipelines to purchase or convey at reasonable rates and without discrimination.--If owner, or operator, or owner of a controlling interest in any pipeline or of any company operating the same which may be operated accessible to the oil or gas derived from lands under this lease, to accept and convey and, if a purchaser of such products, to purchase at reasonable rates and without discrimination the oil or gas of the Government or of any citizen or company not the owner of any pipeline, operating a lease or purchasing or selling oil, gas, natural gasoline, or other products under the provisions of the Act, or under the provision of the Act of August 7, 1947 (61 Stat. 913, 30 U.S.C. sec. 351).

(o) Lands patented with oil and gas deposits reserved to the United States.--To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under the laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(p) Reserved or segregated lands.—If any of the land included in this lease is embraced in a reservation or segregated for any particular purpose to conduct operations thereunder in conformity with such requirements as may be made by the Director, Bureau of Land Management, for the protection and use of the land for the purpose for which it was reserved or segregated, so far as may be consistent with the use of the land for the purpose of this lease, which later shall be regarded as the dominant use unless otherwise provided herein or separately stipulated.

(q) Protection of surface, natural resources, and improvements.--To take such reasonable steps as may be needed to prevent operations on the leased lands from unnecessarily: (1) causing or contributing to soil erosion or damaging crops, including forage, and timber growth thereon or on Federal or non-Federal lands in the vicinity; (2) polluting air and water; (3) damaging improvements owned by the United States or other parties; or (4) destroying, damaging or removing fossils, historic or prehistoric ruins, or artifacts and upon any partial or total relinquishment or the cancellation or expiration of this lease, or at any other time prior thereto when required and to the extent deemed necessary by the lessor to fill any pits, ditches and other excavations, remove or cover all debris, and so far as reasonably possible, restore the surface of the leased land and access roads to their former condition, including the removal of structures as and if required. The lessor may prescribe the steps to be taken and restoration to be made with respect to the leased lands and improvements thereon whether or not owned by the United States. When American antiquities or other objects of historic or scientific interest including but not limited to historic or prehistoric ruins, fossils or artifacts are discovered in the performances of this lease, the item(s) or condition(s) will be left intact and immediately brought to the attention of the contracting officer or his authorized representative.

(r) Overriding royalties.--Not to create overriding royalties in excess of five percent except as otherwise authorized by the regulations.

(s) Deliver premises in case of forfeiture.--To deliver up to the lessor in good order and condition the land leased including all improvements which are necessary for the preservation of producing wells.

SEC. 3. The lessor reserves:

(a) Easements and rights-of-way.--The right to permit for joint or several use easements or rights-of-way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in the Act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees or permittees, and for other public purposes.

(b) Disposition of surface.--The right to lease, sell, or otherwise dispose of the surface of the leased lands under existing law or laws hereafter enacted, insofar as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein, or to dispose of any resource in such lands which will not unreasonably interfere with operations under this lease.

(c) Monopoly and fair prices.--Full power and authority to promulgate and enforce all orders necessary to insure the sale of the production of the leased lands to the United States and to the public at reasonable prices, to protect the interests of the United States, to prevent monopoly, and to safeguard the public welfare.

(d) Helium.--Pursuant to Section 1 of the Act as amended, the ownership of helium and the right to extract or have it extracted from all gas produced under this lease, subject to such rules and regulations as shall be prescribed by the Secretary of the Interior. If the lessor elects to take the helium, the lessee shall deliver all or any portion of gas containing the same to the lessor, in the manner required by the lessor, at any point on the leased premises, or, if the area is served at the time of production by a gas-gathering system owned or operated by the lessee, at any point in that system specified by the lessor, for extraction of the helium by such means as the lessor may provide. The residue shall be returned to the lessee, with no substantial delay in the delivery of the gas produced from the well to the owner or purchaser thereof. Save for the value of the helium extracted, the lessee shall not suffer a diminution of the value of the gas produced from the well, or loss otherwise, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. The lessor reserves the right to erect, maintain, and operate any and all reduction works necessary for extraction of helium on the leased premises. The lessee further agrees to include in any contract of sale of gas from the lands subject to this lease provision setting forth that the lessor owns, and reserves the right to extract or have extracted, any helium in the gas sold, and that the lessor may take the gas from a pipeline carrier or any other gas-gathering system and extract the helium and return the gas to the owner thereof, without delay other than that caused by the extraction process; save for the value of the helium, the owner shall not suffer any diminution of the value of the gas from which helium has been extracted, or any other loss arising from the extraction of helium, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. It is further agreed that any rights reserved vested in the lessor under this paragraph shall also run to any agent or assignee of the lessor or any purchaser of the rights of the lessor.

(e) Taking of royalties.--All rights pursuant to section 36 of the Act to take royalties in amount or in value of production.

(f) Casing.--All rights pursuant to section 40 of the Act to purchase casing and lease or operate valuable water wells.

SEC. 4. Drilling and producing restrictions.--It is agreed that the rate of prospecting and developing and the quantity and rate of production from the lands covered by this lease shall be subject to control in the public interest by the Secretary of the Interior, and in the exercise of his judgment the Secretary may take into consideration, among other things, Federal laws, State laws, and regulations issued thereunder, or lawful agreements among operators regulating either drilling or production, or both. After unitization, the Secretary of the Interior, or any person, committee, or State or Federal officer or agency so authorized in the unit plan, may alter or modify from time to time, the rate of prospecting and development and the quantity and rate of production from the lands covered by this lease.

SEC. 5. Surrender and termination of lease.—The lessee may surrender this lease or any legal subdivision thereof by filing in the proper land office a written relinquishment, in triplicate, which shall be effective as of the date of filing subject to the continued obligation of the lessee and his surety to make payment of all accrued rentals and royalties and to place all wells on the land to be relinquished in condition for suspension or abandonment in accordance with the applicable lease terms and regulations.

SEC. 6 Purchase of materials, etc., on termination of lease.--Upon the expiration of this lease, or the earlier termination thereof pursuant to the last preceding section, the lessee shall have the privilege at any time within a period of 90 days thereafter of removing from the premises all machinery, equipment, tools, and materials other than improvements needed for producing wells. Any materials, tools, appliances, machinery, structures, and equipment subject to removal as above provided, which are allowed to remain on the leased lands shall become the property of the lessor on expiration of the 90-day period or such extension thereof as may be granted because of adverse climatic conditions throughout said periods: **Provided**, That the lessee shall remove any or all of such property where so directed by the lessor.

SEC. 7 Proceedings in case of default.--If the lessee shall not comply with any of the provisions of the Act or the regulations thereunder or of the lease, or make default in the performance or observance of any of the terms hereof (except that of payment of annual rental which results in the automatic termination of the lease), and such default shall continue for a period of 30 days after service of written notice thereof by the lessor, this lease may be canceled by the Secretary of the Interior in accordance with section 31 of the Act, except that if this lease covers lands known to contain valuable deposits of oil or gas, the lease may be canceled only by judicial proceedings in the manner provided in section 31 of the Act; but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. Upon cancellation of this lease, any casing, material, or equipment determined by the lessor to be necessary for use in plugging or preserving any well drilled on the leased land shall become the property of the lessor. A waiver of any particular cause of cancellation and forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of cancellation and forfeiture, or for the same cause occurring at any other time.

SEC. 8 Heirs and successors-in-interest.--It is further agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

SEC. 9 Unlawful interest.—It is further agreed that no Member of, or Delegate to, Congress, or Resident Commissioner, after his election or appointment, or either before or after he has qualified and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior, except as provided in 43 CFR 7.4(a)(1), shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom; and the provisions of Sec. 3741 of the Revised Statutes of the United States, as amended (41 U.S.C. Sec. 22) and Secs. 431, 432 and 433, Title 18 U. S. Code, relating to contracts, enter into and form a part of this lease so far as the same may be applicable.

INSTRUCTIONS

A. GENERAL INSTRUCTIONS

1. This offer must be filled in on a typewriter or printed plainly in ink and must be signed in ink.

2. This form is to be used in offering to lease noncompetitively public domain lands or oil and gas deposits reserved to the United States in disposal of such lands for the purposes of drilling, mining, extracting, removing and disposing of oil and gas deposits, except helium. This form should not be used in offering to lease acquired land or lands on a known geologic structure of a producing oil or gas field.

3. Offers to lease may be made by individuals 21 years of age or over who are citizens of the United States, and by corporations, partnerships or associations.

4. This offer must be prepared in quintuplicate and filed in the proper land office. The term "filing" means the actual receipt of the offer in the proper land office. If the land is in a State for which there is no land office, the offer must be filed with the Bureau of Land Management, Department of the Interior, Washington, D. C. 20240. See 43 CFR 3123.1(b).

5. If additional space is needed in furnishing any of the required information it should be prepared on additional sheets, initialed and attached and made part of this offer to lease, such additional sheets to be attached to each copy of the form submitted.

6. If any of the land described in Item 2 of the offer is open to oil and gas lease filing when the offer is filed but is omitted from the lease for any reason and thereafter becomes available for leasing to the offeror, the original lease will be amended to include the omitted land, unless, before the issuance of the amendment on Form 3120-4, the land office receives the withdrawal of the offer as to such land or an election to receive a separate lease to be dated in accordance with 43 CFR 3122.2, in which case such separate lease will be issued. If the lease is amended the rental charged and the lease term will be the same as though the added land had been included in the original lease when it was issued.

7. As an incident to the assignment of the whole interest in all or any part of the lease, the lessee may assign the whole interest in all or any part of the offer. As an incident to the assignment of an undivided fractional interest in the whole lease, the lessee may assign an undivided fractional interest in the whole offer. Applications for approval of assignments of an offer must include a statement that the assignee agrees to be bound by the offer to the extent it is assigned and must be signed by the assignee. In other instances assignments of the offer will not be approved prior to the issuance of a lease for the lands or deposits covered by said assignments.

8. The offer will be rejected and returned to the offeror and will afford the applicant no priority if not filed in accordance with the appropriate regulations.

APPENDIX A

B. SPECIAL INSTRUCTIONS[1]

Item 2.--Total area of land requested should be shown in acres in space provided at bottom of Item 2. That area, except where the rule of approximation applies, must not exceed 2,560 acres or be less than 640 acres or the equivalent of a section except as provided in 43 CFR 3123.1(d). All of the land must be within a 6-mile square of an area of 6 surveyed sections in length or width. The description of surveyed and unsurveyed lands, or lands covered by protracted surveys must conform to the provisions of 43 CFR 3122.2.

Item 3.--This space is not to be filled in. When lease is issued this space will contain the identification of the leased area and total acres.

Item 4.--The total amount remitted should include a $10 filing fee and the first year's rental of the land requested at the rate of $1.00 an acre or fraction thereof, any fraction being counted as an additional acre. The $10 filing fee is retained as a service charge, even in those cases where the offer to lease is completely rejected. In order to protect the offeror's priorities with respect to the land requested, it is important that the rental payment submitted with the offer be sufficient to cover all the land requested at the rate of 50 cents an acres or fraction thereof. If the land requested includes lots or irregular quarter-quarter sections, the exact area of which is not known to the offeror, rental may be submitted for the purpose of the offer on the basis of each such lot or quarter-quarter section containing 40 acres. If the offer is withdrawn in whole or in part before a lease is issued or if the offer is rejected in whole or in part, the rental remitted for the parts withdrawn or rejected will be returned.

Item 5 (a).--Offeror will indicate whether a citizen by birth or naturalization. If production is obtained under this lease or allocated to it, the citizenship status of the lessee will be verified.

If offeror is an unincorporated association (including a partnership), the offer must be accompanied by a statement giving the same, showing as to citizenship and holdings of its members as required of an individual.

If offeror is a corporation it must submit a statement containing the following information; the State in which it is incorporated; that it is authorized to hold oil and gas leases and that the officer executing the lease is authorized to act on behalf of the corporation in such matters; the percentage of the voting stock and all of the Bureau is over 10 percent, additional information may be required by the Bureau before the lease is issued or when production is obtained. If 10 percent or more of the stock of any class is owned or controlled by or on behalf of any one stockholder a separate showing of his citizenship and holdings must be furnished. Where such material has been previously filed, a reference by serial number to the records in which it has been filed, together with a statement of any amendments, will be accepted.

Item 5 (b)--Acreage included in unitized leases and leases subject to certain development contracts approved by the Secretary under authority of Section 17(b) is not chargeable.

Item 5 (c)--Whenever applicable the stipulations referred to will be made a part of this lease and will be furnished the lessee with the lease when issued. The forms covering them with a brief description are as follows: 3103-2 Stipulations for lands where the surface control is under the jurisdiction of the Department of Agriculture; 3103-1 Lands potentially irrigable, lands within the flow limits of a reservoir site, lands within the drainage area of a constructed reservoir; 3500-1 Land withdrawn for power purposes; and 3120-3 Wildlife Refuge, Game Range, and Coordination Lands. Whenever other stipulations are necessary, lessee will be required to agree to them before the issuance of the lease.

Item 5 (e)--If there are settlers, attach a sheet giving the name and post office address of each and description of the lands claimed by metes and bounds or protracted surveys and approximate legal subdivisions.

Item 6.--Offeror must indicate whether or not be is the sole party in interest in this offer and the lease, if issued. If not the sole party in interest, the offeror must submit at the time the offer is filed a signed statement setting forth the names of the other interested parties. If there are other parties interested in the offer, a separate statement must be signed by them and the offeror, setting forth the nature and extent of the interest of each, the nature of the agreement between them if oral, and a copy of the agreement if written. Such separate statement and written agreement, if any, must be filed within 15 days after the filing of the lease offer. All interested parties must furnish evidence of their qualifications to hold such lease interests.

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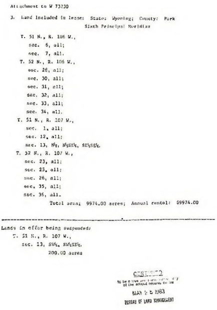
[1] Forms numbered according to numbers on offer form.

APPENDIX A



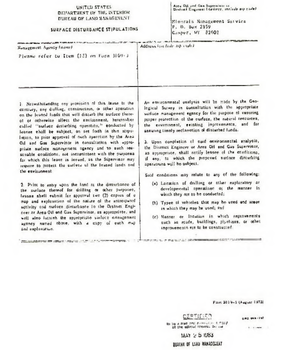
Attachment to W 73230

3. Land Included in lease: State: Wyoming; County: Park
Sixth Principal Meridian

T. 51 N., R. 106 W.,
sec. 6, all;
sec. 7, all.
T. 52 N., R. 106 W.,
sec. 28, all;
sec. 30, all;
sec. 31, all;
sec. 32, all;
sec. 33, all;
sec. 34, all.
T. 51 N., R. 107 W.,
sec. 1, all;
sec. 12, all;
sec. 13, N½, N½SE¼, SE¼SE¼.
T. 52 N., R. 107 W.,
sec. 23, all;
sec. 25, all;
sec. 26, all;
sec. 35, all;
sec. 36, all.
Total area: 9974.00 acres; Annual rental: $9974.00

Lands in offer being suspended:
T. 51 N., R. 107 W.,
sec. 13, SW¼, SW¼SE¼.
200.00 acres

CERTIFIED
to be a true and correct copy
of the official records on file
MAY 25 1983
BUREAU OF LAND MANAGEMENT



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SURFACE DISTURBANCE STIPULATIONS

Area Oil and Gas Supervisor or District Engineer (Address, include zip code)

Minerals Management Service
P. O. Box 2859
Casper, WY 82602

Management Agency (name)

Please refer to Item (12) on Form 3109-3

Address (include zip code)

1. Notwithstanding any provision of this lease to the contrary, any drilling, construction, or other operation on the leased lands that will disturb the surface thereof or otherwise affect the environment, hereinafter called "surface disturbing operation," conducted by lessee shall be subject, as set forth in this stipulation, to prior approval of such operation by the Area Oil and Gas Supervisor in consultation with appropriate surface management agency and to such reasonable conditions, not inconsistent with the purposes for which this lease is issued, as the Supervisor may require to protect the surface of the leased lands and the environment.

2. Prior to entry upon the land or the disturbance of the surface thereof for drilling or other purposes, lessee shall submit for approval two (2) copies of a map and explanation of the nature of the anticipated activity and surface disturbance to the District Engineer or Area Oil and Gas Supervisor, as appropriate, and will also furnish the appropriate surface management agency named above, with a copy of such map and explanation.

An environmental analysis will be made by the Geological Survey in consultation with the appropriate surface management agency for the purpose of assuring proper protection of the surface, the natural resources, the environment, existing improvements, and for assuring timely reclamation of disturbed lands.

3. Upon completion of said environmental analysis, the District Engineer or Area Oil and Gas Supervisor, as appropriate, shall notify lessee of the conditions, if any, to which the proposed surface disturbing operations will be subject.

Said conditions may relate to any of the following:

(a) Location of drilling or other exploratory or developmental operations or the manner in which they are to be conducted;

(b) Types of vehicles that may be used and areas in which they may be used; and

(c) Manner or location in which improvements such as roads, buildings, pipelines, or other improvements are to be constructed.

Form 3109-5 (August 1973)

GPO [illegible]

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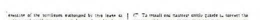
to be a true and correct copy
of the official records on file
MAY 25 1983
BUREAU OF LAND MANAGEMENT



Form 3109-3
(June 1971)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

W 73230

STIPULATION FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE*

The lands embraced in this lease or permit being under the jurisdiction of the Secretary of Agriculture, the lessee or permittee hereby agrees:

(1) To conduct all operations authorized by this lease or permit with due regard for good land management, not to cut or destroy timber without first obtaining permission from the authorized representative of the Secretary of Agriculture, and to pay for all such timber cut or destroyed at the rates prescribed by such representative; to avoid unnecessary damage to improvements, timber, crops, or other cover; unless otherwise authorized by the Secretary of Agriculture, not to drill any well, carry on operations, make excavations, construct tunnels, drill, or otherwise disturb the surface of the lands within 200 feet of any building standing on the lands and whenever required, in writing, by the authorized representative of the Secretary of Agriculture to fence or fill all sump holes, ditches, and other excavations, remove or cover all debris, and so far as reasonably possible, restore the surface of the lands to their former condition, including the removal of structures as and if required, and when required by such representative to bury all pipelines below plow depth.

(2) To do all in his power to prevent and suppress forest, brush, or grass fires on the lands and in their vicinity, and to require his employees, contractors, subcontractors, and employees of contractors or subcontractors to do likewise. Unless prevented by circumstances over which he has no control, the lessee or permittee shall place his employees, contractors, subcontractors, and employees of contractors and subcontractors employed on the lands at the disposal of any authorized officer of the Department of Agriculture for the purpose of fighting forest, brush, or grass fires on or originating on the lands or on adjacent areas or caused by the negligence of the lessee or permittee or his employees, contractors, subcontractors and employees of contractors and subcontractors, with the understanding that payment for such services shall be made at rates to be determined by the authorized representative of the Secretary of Agriculture, which rates shall not be less than the current rates of pay prevailing in the vicinity for services of a similar character: *Provided*, that if the lessee or permittee, his employees, contractors, subcontractors, or employees of contractors or subcontractors, caused or could have prevented the origin or spread of said fire or fires, no payment shall be made for services so rendered.

During periods of serious fire danger to forest, brush, or grass, as may be specified by the authorized representative of the Secretary of Agriculture, the lessee or permittee shall prohibit smoking and the building of camp and lunch fires by his employees, contractors, subcontractors, and employees of contractors or subcontractors within the area involved except at established camps, and shall enforce this prohibition by all means within his power: *Provided*, that the authorized representative of the Secretary of Agriculture may designate safe places where, after all inflammable material has been cleared away, campfires may be built for the purpose of heating lunches and where, at the option of the lessee or permittee, smoking may be permitted.

The lessee or permittee shall not burn rubbish, trash, or other inflammable materials except with the consent of the authorized representative of the Secretary of Agriculture and shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during the forest, brush, or grass fire season, except as authorized to do so or on areas approved by such representative.

The lessee or permittee shall build or construct such fire lines or do such clearing on the lands as the authorized representative of the Secretary of Agriculture decides is essential for forest, brush, and grass fire prevention which is or may be necessitated by the exercise of the privileges authorized by this lease or permit, and shall maintain such fire tools at his headquarters or at the appropriate location on the lands as are deemed necessary by such representative.

(3) In the location, design, construction, and maintenance of all authorized works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures or clearance, the lessee or permittee shall do all things reasonably necessary to prevent or reduce to the fullest extent scarring and erosion of the lands, pollution of the water resources and any damage to the watershed. Where construction, operation, or maintenance of any of the facilities on or connected with this lease or permit causes damage to the watershed or pollution of the water resources, the lessee or permittee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by the authorized representative of the Secretary of Agriculture.

(4) If in the opinion of the authorized representative of the Secretary of Agriculture, the lands are valuable for watershed protection, the lessee or permittee shall provide for control of surface runoff and return the affected area to as productive condition as practicable.

(5) To pay the lessor or permitter or his tenant or the surface owner or his tenant, as the case may be, for any and all damage to or destruction of property caused by the lessee's or permittee's operations hereunder; to save and hold the lessor or permitter or the surface owner or their tenants harmless from all damage or claims for damage to persons or property resulting from the lessee's or permittee's operations under this lease or permit.

(6) To recognize existing uses and commitments, in the form of Department of Agriculture grazing, timber cutting, and special use permits, water developments, ditch, road, trail, pipeline, telephone line, and fence rights-of-way and other similar improvements, and to conduct his operations so as to interfere as little as possible with the rights and privileges granted by these permits or with other existing uses.

(7) To install and maintain cattle guards to prevent the passage of livestock in any openings made in fences by the lessee or permittee or his contractors to provide access to the lands covered by this lease or permit for automotive and other equipment.

(8) If lessee or permittee shall construct any camp on the lands, such camp shall be located at a place approved by the authorized representative of the Secretary of Agriculture, and such representative shall have authority to require that such camp be kept in a neat and sanitary condition.

(9) To comply with all federally-approved rules and regulations of the Secretary of Health, Education, and Welfare governing the emission of pollutants into the air from activities which are embraced in this lease or permit.

(10) To comply with all the rules and regulations of the Secretary of Agriculture governing the national forests or other lands under his jurisdiction which are embraced in this lease or permit.

(11) Unless otherwise authorized, prior to the beginning of operations to appoint and maintain at all times during the term of this lease or permit a local agent upon whom may be served written orders or notices respecting matters contained in this stipulation, and to inform the authorized representative of the Secretary of Agriculture, in writing, of the name and address of such agent. If a substitute agent is appointed, the lessee or permittee shall immediately so inform the said representative.

(12) To address all matters relating to this stipulation
to Wapiti District Ranger
Shoshone National Forest
at West Yellowstone Highway
P.O. Box 961
Cody, WY 82414

who is the authorized representative of the Secretary of Agriculture, or to such other representative as may from time to time, be designated, provided that such designation shall be in writing and be delivered to the lessee or permittee or his agent.

(Signature of Lessee)

Date: 6/29/82

GPO [illegible]

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* This form of stipulation may be used in connection with leases and permits issued under the Acts of February 25, 1920, as amended (30 U.S.C. 181 et seq.), August 7, 1947 (30 U.S.C. 351 et seq.), February 7, 1927, as amended (30 U.S.C. 281 et seq.), April 17, 1926, as amended (30 U.S.C. 271 et seq.); June 28, 1944 (58 Stat. 463–485); September 1, 1949 (30 U.S.C. 192c), June 30, 1950 ([illegible]), or under the authority of any of the Acts cited in Section 402 of the President's Reorganization Plan No. 3 of 1946 (5 U.S.C. 133y–16, Note)

CERTIFIED
to be a true and correct copy
of the official records on file
MAY 25 1983
BUREAU OF LAND MANAGEMENT

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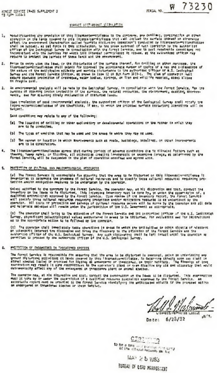
of the official records on file
MAY 25 1983
BUREAU OF LAND MANAGEMENT

APPENDIX A



SERIAL NO. W 73230

Date: 6/28/82

CERTIFIED
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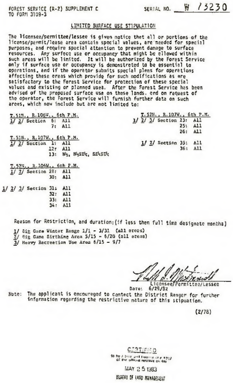
MAY 25 1983
BUREAU OF LAND MANAGEMENT



FOREST SERVICE (R-2) SUPPLEMENT C
TO FORM 3109-3

SERIAL NO. W 73230

LIMITED SURFACE USE STIPULATION

The licensee/permittee/lessee is given notice that all or portions of the license/permit/lease area contain special values, are needed for special purposes, and require special attention to prevent damage to surface resources. Any surface use or occupancy that might be allowed within such areas will be limited. It will be authorized by the Forest Service only if surface use or occupancy is demonstrated to be essential to operations, and if the operator submits special plans for operations affecting these areas which provide for such modifications as are satisfactory to the Forest Service for protection of these special values and existing or planned uses. After the Forest Service has been advised of the proposed surface use on these lands, and on request of the operator, the Forest Service will furnish further data on such areas, which now include but are not limited to:

T.51N., R.106W., 6th P.M.
1/ 2/ Section 6: All
7: All

T.51N., R.107W., 6th P.M.
1/ 2/ Section 1: All
12: All
13: N½, N½SE¼, SE¼SE¼

T.52N., R.106W., 6th P.M.
1/ 2/ Section 28: All
30: All

1/ 2/ 3/ Section 31: All
32: All
33: All
34: All

T.52N., R.107W., 6th P.M.
1/ 2/ 3/ Section 23: All
25: All
26: All

1/ 2/ Section 35: All
36: All

Reason for Restriction, and duration: (if less then full time designate months)

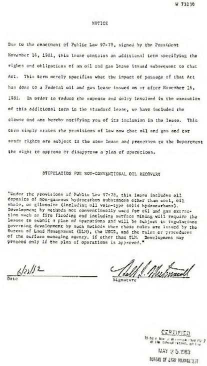
1/ Big Game Winter Range 1/1 - 3/31 (all areas)
2/ Big Game Birthing Area 5/15 - 6/20 (all areas)
3/ Heavy Recreation Use Area 6/15 - 9/7

Licensee/Permittee/Lessee
Date: 6/28/82

Note: The applicant is encouraged to contact the District Ranger for further information regarding the restrictive nature of this stipuation.

(2/78)

CERTIFIED
[illegible]
MAY 25 1983
BUREAU OF LAND MANAGEMENT



W 73230

NOTICE

Due to the enactment of Public Law 97-78, signed by the President November 16, 1981, this lease contains an additional term specifying the rights and obligations of an oil and gas lease issued subsequent to that Act. This term merely specifies what the impact of passage of that Act has done to a Federal oil and gas lease issued on or after November 16, 1981. In order to reduce the expense and delay involved in the execution of this additional term in the standard lease, we have included the clause and are hereby notifying you of its inclusion in the lease. This term simply states the provisions of law now that oil and gas and tar sands rights are subject to the same lease and preserves to the Department the right to approve or disapprove a plan of operations.

STIPULATION FOR NON-CONVENTIONAL OIL RECOVERY

"Under the provisions of Public Law 97-78, this lease includes oil deposits of non-gaseous hydrocarbon substances other than coal, oil shale, or gilsonite (including oil vein-type solid hydrocarbons). Development by methods not conventionally used for oil and gas extraction such as fire flooding and including surface mining will require the lessee to submit a plan of operations and will be subject to regulations governing development by such methods when those rules are issued by the Bureau of Land Management (BLM), the USGS, and the rules or procedures of the surface managing agency, if other than BLM. Development may proceed only if the plan of operations is approved."

6/23/82
Date

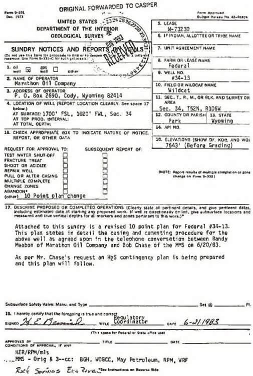
Signature

CERTIFIED
[illegible]
MAY 25 1983
BUREAU OF LAND MANAGEMENT

APPENDIX B

APD; NOTICES AND REPORTS; SAFETY PROVISIONS

This appendix contains reproductions or copies of the APD, sundry notices and reports, the blowout prevention policy, and multi-point surface use and operations plan, and the hydrogen sulfide contingency plan.



ORIGINAL FORWARDED TO CASPER

Form 9-331
Dec. 1973

Form Approved.
Budget Bureau No. 42-R1424

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

JUN 1983
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SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use Form 9-331-C for such proposals.)

1. oil well ☒ gas well ☐ other
2. NAME OF OPERATOR
Marathon Oil Company
3. ADDRESS OF OPERATOR
P. O. Box 2690, Cody, Wyoming 82414
4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 1700' FSL, 1020' FWL, Sec. 34
AT TOP PROD. INTERVAL:
AT TOTAL DEPTH:

5. LEASE
W-73230
6. IF INDIAN, ALLOTTEE OR TRIBE NAME
7. UNIT AGREEMENT NAME
8. FARM OR LEASE NAME
Federal
9. WELL NO.
#34-13
10. FIELD OR WILDCAT NAME
Wildcat
11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
Sec. 34, T52N, R106W
12. COUNTY OR PARISH Park
13. STATE Wyoming
14. API NO.
16. ELEVATIONS (SHOW DF, KDB, AND WD)
7643' (Before Grading)

16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

REQUEST FOR APPROVAL TO:		SUBSEQUENT REPORT OF:
TEST WATER SHUT-OFF	☐	☐
FRACTURE TREAT	☐	☐
SHOOT OR ACIDIZE	☐	☐
REPAIR WELL	☐	☐
PULL OR ALTER CASING	☐	☐
MULTIPLE COMPLETE	☐	☐
CHANGE ZONES	☐	☐
ABANDON*	☐	☐
(other) 10 Point plan change		

(NOTE: Report results of multiple completion or zone change on Form 9-330.)

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

Attached to this sundry is a revised 10 point plan for Federal #34-13. This plan states in detail the casing and cementing procedure for the above well as agreed upon in the telephone conversation between Randy Meabon of Marathon Oil Company and Bob Chase of the MMS on 6/20/83.

As per Mr. Chase's request an H_2S contingency plan is being prepared and this plan will follow.

Subsurface Safety Valve: Manu. and Type ______ Set @ ______ Ft.

18. I hereby certify that the foregoing is true and correct
SIGNED ______ TITLE Regulatory Coordinator DATE 6-21/1983

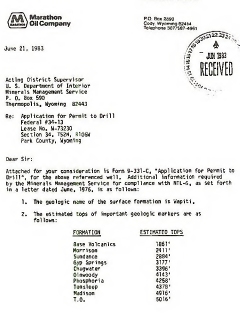
(This space for Federal or State office use)

APPROVED BY ______ TITLE ______ DATE ______
CONDITIONS OF APPROVAL, IF ANY:

HER/RPM/mls
MMS - Orig & 3--cc: BGH, WOGCC, May Petroleum, RPM, WRF

Rock Springs [illegible]

*See Instructions on Reverse Side



Marathon Oil Company

Casper Division
Production, United States

P.O. Box 2690
Cody, Wyoming 82414
Telephone 307/587-4961

JUN 1983
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June 21, 1983

Acting District Supervisor
U. S. Department of Interior
Minerals Management Service
P. O. Box 590
Thermopolis, Wyoming 82443

Re: Application for Permit to Drill
Federal #34-13
Lease No. W-73230
Section 34, T52N, R106W
Park County, Wyoming

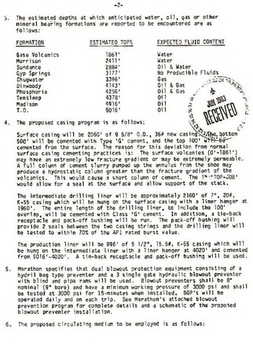
Dear Sir:

Attached for your consideration is Form 9-331-C, "Application for Permit to Drill", for the above referenced well. Additional information required by the Minerals Management Service for compliance with NTL-6, as set forth in a letter dated June, 1976, is as follows:

1. The geologic name of the surface formation is Wapiti.

2. The estimated tops of important geologic markers are as follows:

FORMATION	ESTIMATED TOPS
Base Volcanics	1861'
Morrison	2411'
Sundance	2884'
Gyp Springs	3177'
Chugwater	3396'
Dinwoody	4143'
Phosphoria	4258'
Tensleep	4378'
Madison	4916'
T.D.	5016'



-2-

3. The estimated depths at which anticipated water, oil, gas or other mineral bearing formations are reported to be encountered are as follows:

FORMATION	ESTIMATED TOPS	EXPECTED FLUID CONTENT
Base Volcanics	1861'	Water
Morrison	2411'	Water
Sundance	2884'	Oil & Water
Gyp Springs	3177'	No Producible Fluids
Chugwater	3396'	Gas
Dinwoody	4143'	Oil & Gas
Phosphoria	4258'	Oil & Gas
Tensleep	4378'	Oil
Madison	4916'	Oil
T.D.	5016'	Oil

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4. The proposed casing program is as follows:

Surface casing will be 2060' of 9 5/8" O.D., 36# new casing. The bottom 500' will be cemented with Type 'G' cement, and the top 100' will be cemented from the surface. The reason for this deviation from normal surface casing cementing practices is: The surface volcanies (0'-1861') may have an extremely low fracture gradient or may be extremely permeable. A full column of cement slurry pumped up the annulus from the shoe may produce a hydrostatic column greater than the fracture gradient of the volcanics. This would cause a short column of cement. The 1" 'TOP-JOB' would allow for a seal at the surface and allow support of the stack.

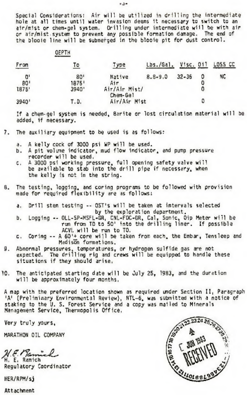
The intermediate drilling liner will be approximately 2160' of 7", 20#, K-55 casing which will be hung on the surface casing with a liner hanger at 1960'. The entire length of the drilling liner, to include the 100' overlap, will be cemented with Class 'G' cement. In addition, a tie-back receptacle and pack-off bushing will be run. The pack-off bushing will provide 2 seals between the two casing strings and the drilling liner will be tested to within 70% of the API rated burst value.

The production liner will be 996' of 5 1/2", 15.5#, K-55 casing which will be hung on the intermediate liner with a liner hanger at 4020' and cemented from 5016'-4020'. A tie-back receptacle and pack-off bushing will be used.

5. Marathon specifies that dual blowout protection equipment consisting of a hydril bag type preventer and a 3 single gate hydraulic blowout preventer with blind and pipe rams will be used. Blowout preventers shall be 8" nominal (9" bore) and have a minimum working pressure of 3000 psi and shall be tested at 3000 psi for 15-minutes when installed. BOP's will be operated daily and on each trip. See Marathon's attached blowout prevention program for complete details and a schematic of the proposed blowout preventer installation.

6. The proposed circulating medium to be employed is as follows:

APPENDIX B



-3-

Special Considerations: Air will be utilized in drilling the intermediate hole at all times until water invasion deems it necessary to switch to an air/mist or chem-gel system. Drilling under intermediate will be with air or air/mist system to prevent any possible formation damage. The end of the blooie line will be submerged in the blooie pit for dust control.

DEPTH From	To	Type	Lbs./Gal.	Visc.	Oil	LOSS CC
0'	80'	Native	8.8-9.0	32-36	0	NC
80'	1875'	Air			0	
1875'	3940'	Air/Air Mist/ Chem-Gel			0	
3940'	T.D.	Air/Air Mist			0	

If a chem-gel system is needed, Barite or lost circulation material will be added, if necessary.

7. The auxiliary equipment to be used is as follows:
   - a. A kelly cock of 3000 psi WP will be used.
   - b. A pit volume indicator, mud flow indicator, and pump pressure recorder will be used.
   - c. A 3000 psi working pressure, full opening safety valve will be available to stab into the drill pipe if necessary, when the kelly is not in the string.
8. The testing, logging, and coring programs to be followed with provision made for required flexibility are as follows:
   - a. Drill stem testing -- DST's will be taken at intervals selected by the exploration department.
   - b. Logging -- DLL-SP-MSFL-GR, CNL-FDC-GR, Cal, Sonic, Dip Meter will be run from TD to 50' into the drilling liner. If possible ACVL will be run to TD.
   - c. Coring -- A 60'± core will be taken from each, the Embar, Tensleep and Madison formations.
9. Abnormal pressures, temperatures, or hydrogen sulfide gas are not expected. The drilling rig and crews will be equipped to handle these situations if they should arise.
10. The anticipated starting date will be July 25, 1983, and the duration will be approximately four months.

A map with the preferred location shown as required under Section II, Paragraph 'A' (Preliminary Environmental Review), NTL-6, was submitted with a notice of staking to the U. S. Forest Service and a copy was mailed to Minerals Management Service, Thermopolis Office.

Very truly yours,

MARATHON OIL COMPANY

H. E. Ramich
H. E. Ramich
Regulatory Coordinator

HER/RPM/sj

Attachment

JUN 1983
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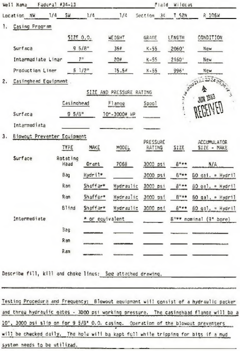

Well Name Federal #34-13 Field Wildcat

Location NW 1/4 SW 1/4 ____ 1/4 Section 34 T 52N R 106W

1. Casing Program

	SIZE O.D.	WEIGHT	GRADE	LENGTH	CONDITION
Surface	9 5/8"	36#	K-55	2060'	New
Intermediate Liner	7"	20#	K-55	2160'	New
Production Liner	5 1/2"	15.5#	K-55	996'	New

2. Casinghead Equipment

SIZE AND PRESSURE RATING

	Casinghead	Flange	Spool
Surface	9 5/8"	10"-3000# WP	
Intermediate			

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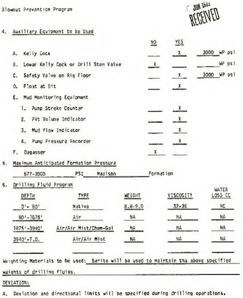
3. Blowout Preventer Equipment

	TYPE	MAKE	MODEL	PRESSURE RATING	SIZE	ACCUMULATOR SIZE - MAKE
Surface	Rotating Head	Grant	7068	3000 psi	8"**	N/A
	Bag	Hydril*		3000 psi	8"**	80 gal. - Hydril
	Ram	Shaffer*	Hydraulic	3000 psi	8"**	80 gal. - Hydril
	Ram	Shaffer*	Hydraulic	3000 psi	8"**	80 gal. - Hydril
	Blind	Shaffer*	Hydraulic	3000 psi	8"**	80 gal. - Hydril
Intermediate		* or equivalent			8"** nominal (9" bore)	
	Bag					
	Ram					
	Ram					

Describe fill, kill and choke lines: See attached drawing.

Testing Procedure and Frequency: Blowout equipment will consist of a hydraulic packer and three hydraulic gates - 3000 psi working pressure. The casinghead flange will be a 10", 3000 psi slip on for 9 5/8" O.D. casing. Operation of the blowout preventers will be checked daily. The hole will be kept full while tripping for bits if a mud system needs to be utilized.



Blowout Prevention Program

JUN 1983
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4. Auxiliary Equipment to be Used

	NO	YES	
A. Kelly Cock		X	3000 WP psi
B. Lower Kelly Cock or Drill Stem Valve	X		WP psi
C. Safety Valve on Rig Floor		X	3000 WP psi
D. Float at Bit		X	
E. Mud Monitoring Equipment			
1. Pump Stroke Counter		X	
2. Pit Volume Indicator		X	
3. Mud flow Indicator		X	
4. Pump Pressure Recorder		X	
F. Degasser	X		

5. Maximum Anticipated Formation Pressure

677-3000 PSI Madison Formation

6. Drilling Fluid Program

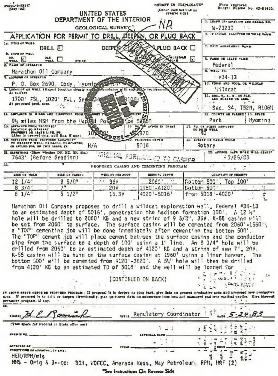
DEPTH	TYPE	WEIGHT	VISCOSITY	WATER LOSS CC
0'- 80'	Native	8.8-9.0	32-36	NC
80'-1875'	Air	NA	NA	NA
1875'-3940'	Air/Air Mist/Chem-Gel	NA	NA	NA
3940'-T.D.	Air/Air Mist	NA	NA	NA

Weighting Materials to be used: Barite will be used to maintain the above specified weights of drilling fluids.

DEVIATION:

A. Deviation and directional limits will be specified during drilling operations.

B. Directional surveys will be run, as required.



Form 9-331 C
(May 1963)

SUBMIT IN TRIPLICATE*
(Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1425.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

NA

APPLICATION FOR PERMIT TO DRILL, DEEPEN, OR PLUG BACK

5. LEASE DESIGNATION AND SERIAL NO. W-73230
6. IF INDIAN, ALLOTTEE OR TRIBE NAME
1a. TYPE OF WORK DRILL ☒ DEEPEN ☐ PLUG BACK ☐
7. UNIT AGREEMENT NAME
b. TYPE OF WELL OIL WELL ☒ GAS WELL ☐ OTHER SINGLE ZONE MULTIPLE ZONE ☒
8. FARM OR LEASE NAME Federal
2. NAME OF OPERATOR Marathon Oil Company
9. WELL NO. #34-13
3. ADDRESS OF OPERATOR P. O. Box 2690, Cody, Hyomin
10. FIELD AND POOL, OR WILDCAT Wildcat
4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.*)
At surface 1700' FSL, 1020' FWL, Se 34 R106W
At proposed prod. zone
11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA Sec. 34, T52N, R106W
14. DISTANCE IN MILES AND DIRECTION FROM NEAREST TOWN OR POST OFFICE* 9½ miles NSH from the Hap[illegible] Po[illegible]ice 82450
12. COUNTY OR PARISH Park
13. STATE Wyoming
15. DISTANCE FROM PROPOSED* LOCATION TO NEAREST PROPERTY OR LEASE LINE, FT. (Also to nearest drig. unit line, if any) 10[illegible]00'
16. NO. OF ACRES IN LEASE [illegible]970
17. NO. OF ACRES ASSIGNED TO THIS WELL 40
18. DISTANCE FROM PROPOSED LOCATION* TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR, ON THIS LEASE, FT. N/A
19. PROPOSED DEPTH 5016
20. ROTARY OR CABLE TOOLS Rotary
21. ELEVATIONS (Show whether DF, RT, GR, etc.) 7643' (Before Grading)
22. APPROX. DATE WORK WILL START* 7/25/83

ORIGINAL FORWARDED TO CASPER

23. PROPOSED CASING AND CEMENTING PROGRAM

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	SETTING DEPTH	QUANTITY OF CEMENT
12 1/4"	9 5/8"	36#	2060'	Bottom 500', Top 100'
8 3/4"	7"	20#	1960'-4120'	Bottom 500'
6 1/4"	5 1/2"	15.5#	4020'-5016'	from 5016'-4020'

Marathon Oil Company proposes to drill a wildcat exploration well, Federal #34-13 to an estimated depth of 5016', penetrating the Madison formation 100'. A 12 ¼" hole will be drilled to 2060' KB and a new string of 9 5/8", 36#, K-55 casing will be set from 2060' to surface. The surface casing will be cemented from 2060'-1560'; a "TOP" cementing job will be done immediately after cementing the bottom 500'. The "TOP" cement job will place cement between the surface casing and the conductor pipe from the surface to a depth of 100' using a 1" line. An 8 3/4" hole will be drilled from 2060' to an estimated depth of 4120' KB and a string of new 7", 20#, K-55 casing will be hung on the surface casing at 1960' using a liner hanger. The bottom 500' will be cemented from 4120'-3620'. A 5¾" hole will then be drilled from 4120' KB to an estimated TD of 5016' and the well will be logged for

(CONTINUED ON BACK)

IN ABOVE SPACE DESCRIBE PROPOSED PROGRAM: If proposal is to deepen or plug back, give data on present productive zone and proposed new productive zone. If proposal is to drill or deepen directionally, give pertinent data on subsurface locations and measured and true vertical depths. Give blowout preventer program, if any.

24.
SIGNED H. E. Ramich TITLE Regulatory Coordinator DATE 5-24-83

(This space for Federal or State office use)

PERMIT NO. ____ APPROVAL DATE ____

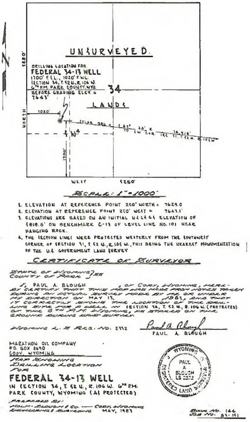
APPROVED BY ____ TITLE ____ DATE ____

CONDITIONS OF APPROVAL, IF ANY:

HER/RPM/mls
MMS - Orig & 3--cc: BGH, WOGCC, Amerada Hess, May Petroleum, RPM, WRF (2)

*See Instructions On Reverse Side

APPENDIX B


UNSURVEYED
DRILLING LOCATION FOR
FEDERAL 34-13 WELL
1700' F.S.L., 1020' F.W.L.
SECTION 34, T.52 N., R.106 W.
6TH P.M. PARK COUNTY, WYO.
BEFORE GRADING ELEV. = 7643'
34
LANDS
1020'
SOLAR BRG. = S 83° 38' E 14,918' TO SW COR. SEC. 31, T.52 N. R.105 W.
1700'
5280'
NORTH
WEST
5280'
N

SCALE: 1" = 1000'

1. ELEVATION AT REFERENCE POINT 250' NORTH = 7629.0
2. ELEVATION AT REFERENCE POINT 250' WEST = 7643.1'
3. ELEVATIONS ARE BASED ON AN INITIAL U.S.C.&G.S. ELEVATION OF 5818.8' ON BENCHMARK C-13 OF LEVEL LINE NO. 101 NEAR HANGING ROCK.
4. THE SECTION LINES WERE PROTECTED WESTERLY FROM THE SOUTHWEST CORNER OF SECTION 31, T. 52 N., R. 105 W., THIS BEING THE NEAREST MONUMENTATION OF THE U.S. GOVERNMENT LAND SURVEY

CERTIFICATE OF SURVEYOR

STATE OF WYOMING } SS
COUNTY OF PARK }

I, PAUL A. BLOUGH, OF CODY, WYOMING, HEREBY CERTIFY THAT THIS MAP WAS MADE FROM NOTES TAKEN DURING AN ACTUAL SURVEY MADE BY ME OR UNDER MY DIRECTION ON MAY 13, 1983, AND THAT IT CORRECTLY SHOWS THE LOCATION OF THE DRILLING SITE FOR A WELL IN SECTION 34, T. 52 N., R. 106 W. (PROTECTED) OF THE 6TH P.M. WYOMING, AS STAKED ON THE GROUND DURING SAID SURVEY.

WYOMING L. S. REG. NO. 2332

Paul A. Blough
PAUL A. BLOUGH

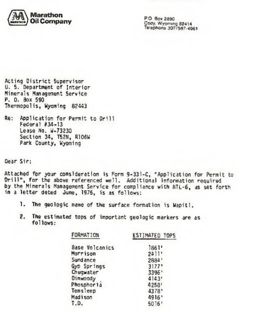
PAUL A BLOUGH LS 2332

MARATHON OIL COMPANY
P.O. BOX 2690
CODY, WYOMING

MAP SHOWING
DRILLING LOCATION
FOR
FEDERAL 34-13 WELL
IN SECTION 34, T. 52 N., R. 106 W. 6TH P.M.
PARK COUNTY, WYOMING (AS PROTECTED)

PREPARED BY:
HOLM-BLOUGH & CO. — CODY, WYOMING
ENGINEERING & SURVEYING MAY, 1983

BOOK NO. 144
JOB NO. 83-151



Marathon Oil Company

Casper Division
Production, United States

P.O. Box 2690
Cody, Wyoming 82414
Telephone 307/587-4961

Acting District Supervisor
U. S. Department of Interior
Minerals Management Service
P. O. Box 590
Thermopolis, Wyoming 82443

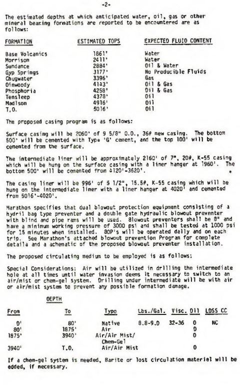
Re: Application for Permit to Drill
Federal #34-13
Lease No. W-73230
Section 34, T52N, R106W
Park County, Wyoming

Dear Sir:

Attached for your consideration is Form 9-331-C, "Application for Permit to Drill", for the above referenced well. Additional information required by the Minerals Management Service for compliance with NTL-6, as set forth in a letter deted June, 1976, is as follows:

1. The geologic name of the surface formation is Wapiti.
2. The estimated tops of important geologic markers are as follows:

FORMATION	ESTIMATED TOPS
Base Volcanics	1861'
Morrison	2411'
Sundance	2884'
Gyp Springs	3177'
Chugwater	3396'
Dinwoody	4143'
Phosphoria	4258'
Tensleep	4378'
Madison	4916'
T.D.	5016'



-2-

3. The estimated depths at which anticipated water, oil, gas or other mineral bearing formations are reported to be encountered are as follows:

FORMATION	ESTIMATED TOPS	EXPECTED FLUID CONTENT
Base Volcanics	1861'	Water
Morrison	2411'	Water
Sundance	2884'	Oil & Water
Gyp Springs	3177'	No Producible Fluids
Chugwater	3396'	Gas
Dinwoody	4143'	Oil & Gas
Phosphoria	4258'	Oil & Gas
Tensleep	4378'	Oil
Madison	4916'	Oil
T.D.	5016'	Oil

4. The proposed casing program is as follows:

   Surface casing will be 2060' of 9 5/8" O.D., 36# new casing. The bottom 500' will be cemented with Type 'G' cement, and the top 100' will be cemented from the surface.

   The intermediate liner will be approximately 2160' of 7", 20#, K-55 casing which will be hung on the surface casing with a liner hanger at 1960'. The bottom 500' will be cemented from 4120'-3620'.

   The casing liner will be 996' of 5 1/2", 15.5#, K-55 casing which will be hung on the intermediate liner with a liner hanger at 4020' and cemented from 5016'-4020'.

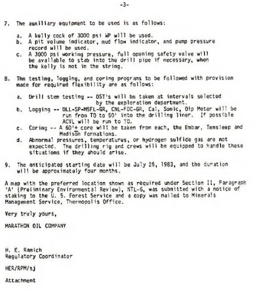
5. Marathon specifies that dual blowout protection equipment consisting of a hydril bag type preventer and a double gate hydraulic blowout prevnnter with blind and pipe rams will be used. Blowout preventers shall be 8" and have a minimum working pressure of 3000 psi and shall be tested at 1000 psi for 15 minutes when installed. BOP's will be operated daily and on each trip. See Marathon's attached blowout prevention Program for complete detaila and a achematic of the proposed blowout preventer installation.

6. The proposed circulating medium to be employed is as follows:

   Special Considerations: Air will be utilized in drilling thn intermediate hole at all times until water invasion deems it necessary to switch to an air/mist or chem-gel system. Drilling under intermediate will be with air or air/mist system to prevent any possible formation damage.

DEPTH						
From	To	Typo	Lbs./Gal.	Visc.	Oil	LOSS CC
0'	80'	Native	8.8-9.0	32-36	0	NC
80'	1875'	Air			0	
1875'	3940'	Air/Air Mist/ Chem-Gel			0	
3940'	T.D.	Air/Air Mist			0	

   If a chem-gel system is needed, Barite or lost circulation materiel will be edded, if necessary.



-3-

7. The auxiliary equipment to be used is as follows:
   - a. A kelly cock of 3000 psi WP will be used.
   - b. A pit volume indicator, mud flow indicator, and pump pressure record will be used.
   - c. A 3000 psi working pressure, full opening safety valve will be available to stab into the drill pipe if necessary, when the kelly is not in the string.
8. Thn testing, logging, and coring programs to be followed with provision made for required flexibility are as follows:
   - a. Drill stem testing -- DST's will bn taken at intervals selected by the exploration department.
   - b. Logging -- DLL-SP-MSFL-GR, CNL-FDC-GR, Cal, Sonic, Dip Meter will be run from TD to 50' into the drilling liner. If possible ACVL will be run to TD.
   - c. Coring -- A 60'± core will be taken from each, the Embar, Tensleep and Madison formations.
   - d. Abnormal pressures, temperatures, or hydrogen sulfide gas are not expected. The drilling rig and crews will be equipped to handle these situations if they ahould arise.
9. The enticipated starting date will be July 25, 1983, and the duration will be approximately four months.

A map with the preferred location shown as required under Section II, Paragraph 'A' (Preliminary Environmental Review), NTL-6, was submitted with a notice of staking to the U. S. Forest Service and a copy was mailed to Minerals Management Service, Thermopolis Office.

Very truly yours,

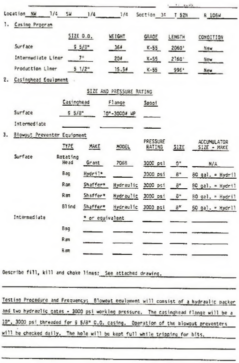
MARATHON OIL COMPANY

H. E. Ramich
Regulatory Coordinator

HER/RPM/sj

Attachment

APPENDIX B



Location NW 1/4 SW 1/4 1/4 Section 34 T 52N R 106W

1. Casing Program

	SIZE O.D.	WEIGHT	GRADE	LENGTH	CONDITION
Surface	9 5/8"	36#	K-55	2060'	New
Intermediate Liner	7"	20#	K-55	2160'	New
Production Liner	5 1/2"	15.5#	K-55	996'	New

2. Casinghead Equipment

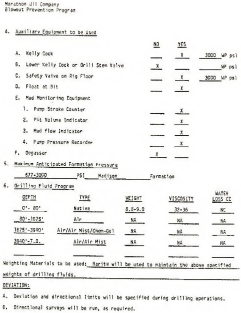
	SIZE AND PRESSURE RATING		
	Casinghead	Flange	Spool
Surface	9 5/8"	10"-3000# WP	
Intermediate			

3. Blowout Preventer Equipment

	TYPE	MAKE	MODEL	PRESSURE RATING	SIZE	ACCUMULATOR SIZE - MAKE
Surface	Rotating Head	Grant	7068	3000 psi	0"	N/A
	Bag	Hydril*		3000 psi	8"	80 gal. = Hydril
	Ram	Shaffer*	Hydraulic	3000 psi	8"	80 gal. = Hydril
	Ram	Shaffer*	Hydraulic	3000 psi	8"	80 gal. = Hydril
	Blind	Shaffer*	Hydraulic	3000 psi	8"	60 gal. = Hydril
Intermediate		* or equivalent				
	Bag					
	Ram					
	Ram					

Describe fill, kill and choke lines: See attached drawing.

Testing Procedure and Frequency: Blowout equipment will consist of a hydraulic packer and two hydraulic gates - 3000 psi working pressure. The casinghead flange will be a 10", 3000 psi threaded for 9 5/8" O.D. casing. Operation of the blowout preventers will be checked daily. The hole will be kept full while tripping for bits.



Marathon Oil Company
Blowout Prevention Program

4. Auxiliary Equipment to be Used

	NO	YES	
A. Kelly Cock		X	3000 WP psi
B. Lower Kelly Cock or Drill Stem Valve	X		WP psi
C. Safety Valve on Rig Floor		X	3000 WP psi
D. Float at Bit		X	
E. Mud Monitoring Equipment			
1. Pump Stroke Counter		X	
2. Pit Volume Indicator		X	
3. Mud flow Indicator		X	
4. Pump Pressure Recorder		X	
F. Degasser	X		

5. Maximum Anticipated Formation Pressure

677-3000 PSI Madison Formation

6. Drilling Fluid Program

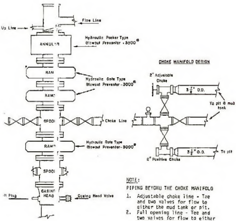
DEPTH	TYPE	WEIGHT	VISCOSITY	WATER LOSS CC
0'- 80'	Native	8.8-9.0	32-36	NC
80'-1875'	Air	NA	NA	NA
1875'-3940'	Air/Air Mist/Chem-Gel	NA	NA	NA
3940'-T.D.	Air/Air Mist	NA	NA	NA

Weighting Materials to be used: Barite will be used to maintain the above specified weights of drilling fluids.

DEVIATION:

A. Deviation and directional limits will be specified during drilling operations.

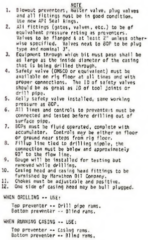
B. Directional surveys will be run, as required.



NOTE:

PIPING BEYOND THE CHOKE MANIFOLD

1. Adjustable choke line - Tee and two valves for flow to either the mud tank or pit.
2. Full opening line - Tee and two valves for flow to either the mud tank or pit.



NOTE

1. Blowout preventers, master valve, plug valves and all fittings must be in good condition. Use new API Seal Rings.
2. All fittings (gates, valves, etc.) to be of equivalent pressure rating as preventers. Valves to be flanged & at least 2" unless otherwise specified. Valves next to BOP to be plug type and nominal 3".
3. Equipment through which bit must pass shall be as large as the inside diameter of the casing that is being drilled through.
4. Safety valve (OMSCO or equivalent) must be available on rig floor at all times and with proper connections. The ID of safety valves should be as great as ID of tool joints or drill pipe.
5. Kelly safety valve installed, same working pressure as BOP.
6. All lines and controls to preventers must be connected and tested before drilling out of surface pipe.
7. BOPs must be fluid operated, complete with accumulator. Controls may be either on floor or ground near steps from rig floor.
8. Fillup line tied to drilling nipple, the connection must be below and approximately 90° to the flow line.
9. Gauge will be installed for testing but removed while drilling.
10. Casing head and casing head fittings to be furnished by Marathon Oil Company.
11. Chokes must be adjustable and positive.
12. One side of casing head may be bull plugged.

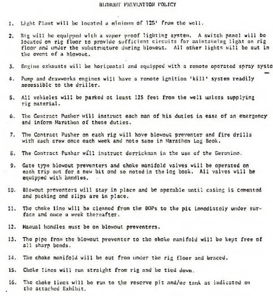
WHEN DRILLING -- USE:

Top preventer -- Drill pipe rams.
Bottom preventar -- Blind rams.

WHEN RUNNING CASING -- USE:

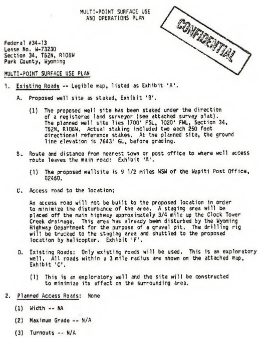
Top preventer -- Casing rams.
Bottom preventer -- Blind rams.

APPENDIX B



BLOWOUT PREVENTION POLICY

1. Light Plant will be located a minimum of 125' from the well.
2. Rig will be equipped with a vapor proof lighting system. A switch panel will be located on rig floor to provide sufficient circuits for maintaining light on rig floor and under the substructure during blowout. All other lights will be out in the event of a blowout.
3. Engine exhausts will be horizontal and equipped with a remote operated spray system.
4. Pump and drawworks engines will have a remote ignition 'kill' system readily accessible to the driller.
5. All vehicles will be parked at least 125 feet from the well unless supplying rig material.
6. The Contract Pusher will instruct each man of his duties in case of an emergency and inform Marathon of these duties.
7. The Contract Pusher on each rig will have blowout preventer and fire drills with each crew once each week and note same in Marathon Log Book.
8. The Contract Pushar will instruct derrickman in the use of the Geronimo.
9. Gate type blowout preventers and choke manifold valves will be operated on each trip out for a new bit and so noted in the log book. All valves will be equipped with handles.
10. Blowout preventers will stay in place and be operable until casing is cemented and packing and slips are in place.
11. The choke line will be cleaned from the BOPs to the pit immediately under surface and once a week thereafter.
12. Manual handles must be on blowout preventers.
13. The pipe from the blowout preventer to the choke manifold will be kept free of all sharp bends.
14. The choke manifold will be out from under the rig floor and braced.
15. Choke lines will run straight from rig and be tied down.
16. The choke lines will be run to the reserve pit and/or tank as indicated on the attached Exhibit.



MULTI-POINT SURFACE USE
AND OPERATIONS PLAN

CONFIDENTIAL

Federal #34-13
Lease No. W-73230
Section 34, T52N, R106W
Park County, Wyoming

MULTI-POINT SURFACE USE PLAN

1. Existing Roads -- Legible map, listed as Exhibit 'A'.

   A. Proposed well site as staked, Exhibit 'B'.

      (1) The proposed well site has been staked under the direction of a registered land surveyor (see attached survey plat). The planned well site lies 1700' FSL, 1020' FWL, Section 34, T52N, R106W. Actual staking included two each 250 foot directional reference stakes. At the planned site, the ground line elevation is 7643' GL, before grading.

   B. Route and distance from nearest town or post office to where well access route leaves the main road: Exhibit 'A'.

      (1) The proposed wellsite is 9 1/2 miles WSW of the Wapiti Post Office, 82450.

   C. Access road to the location:

   An access road will not be built to the proposed location in order to minimize the disturbance of the area. A staging area will be placed off the main highway approximately 3/4 mile up the Clock Tower Creek drainage. This area has already been disturbed by the Wyoming Highway Department for the purpose of a gravel pit. The drilling rig will be trucked to the staging area and shuttled to the proposed location by helicopter. Exhibit 'F'.

   D. Existing Roads: Only existing roads will be used. This is an exploratory well. All roads within a 3 mile radius are shown on the attached map, Exhibit 'C'.

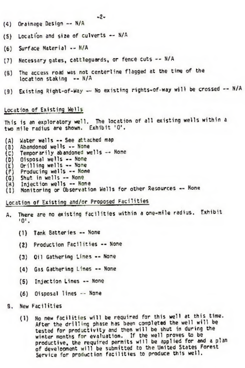
      (1) This is an exploratory well and the site will be constructed to minimize its affect on the surrounding area.

2. Planned Access Roads: None

   (1) Width -- NA

   (2) Maximum Grade -- N/A

   (3) Turnouts -- N/A



-2-

   (4) Drainage Design -- N/A

   (5) Location and size of culverts -- N/A

   (6) Surface Material -- N/A

   (7) Necessary gates, cattleguards, or fence cuts -- N/A

   (8) The access road was not centerline flagged at the time of the location staking -- N/A

   (9) Existing Right-of-Way -- No existing rights-of-way will be crossed -- N/A

3. Location of Existing Wells

   This is an exploratory well. The location of all existing wells within a two mile radius are shown. Exhibit 'D'.

   (A) Water wells -- See attached map
   (B) Abandoned wells -- None
   (C) Temporarily abandoned wells -- None
   (D) Disposal wells -- None
   (E) Drilling wells -- None
   (F) Producing wells -- None
   (G) Shut in wells -- None
   (H) Injection wells -- None
   (I) Monitoring or Observation Wells for other Resources -- None

4. Location of Existing and/or Proposed Facilities

   A. There are no existing facilities within a one-mile radius. Exhibit 'D'.

      (1) Tank Batteries -- None

      (2) Production Facilities -- None

      (3) Oil Gathering Lines -- None

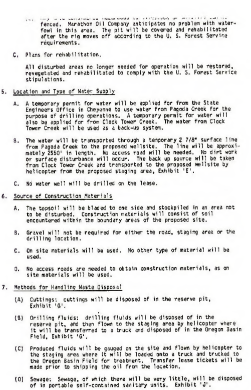
      (4) Gas Gathering Lines -- None

      (5) Injection Lines -- None

      (6) Disposal lines -- None

   B. New Facilities

      (1) No new facilities will be required for this well at this time. After the drilling phase has been completed the well will be tested for productivity and then will be shut in during the winter months for evaluation. If the well proves to be productive, the required permits will be applied for and a plan of development will be submitted to the United States Forest Service for production facilities to produce this well.



[illegible] fenced. Marathon Oil Company anticipates no problem with waterfowl in this area. The pit will be covered and rehabilitated after the rig moves off according to the U. S. Forest Service requirements.

   C. Plans for rehabilitation.

   All disturbed areas no longer needed for operation will be restored, revegetated and rehabilitated to comply with the U. S. Forest Service stipulations.

5. Location and Type of Water Supply

   A. A temporary permit for water will be applied for from the State Engineers Office in Cheyenne to use water from Pagoda Creek for the purpose of drilling operations. A temporary permit for water will also be applied for from Clock Tower Creek. The water from Clock Tower Creek will be used as a back-up system.

   B. The water will be transported through a temporary 2 7/8" surface line from Pagoda Creek to the proposed wellsite. The line will be approximately 2550' in length. No access road will be needed. No dirt work or surface disturbance will occur. The back up source will be taken from Clock Tower Creek and transported to the proposed wellsite by helicopter from the proposed staging area, Exhibit 'E'.

   C. No water well will be drilled on the lease.

6. Source of Construction Materials

   A. The topsoil will be bladed to one side and stockpiled in an area not to be disturbed. Construction materials will consist of soil encountered within the boundary areas of the proposed site.

   B. Gravel will not be required for either the road, staging area or the drilling location.

   C. On site materials will be used. No other type of material will be used.

   D. No access roads are needed to obtain construction materials, as on site materials will be used.

7. Methods for Handling Waste Disposal

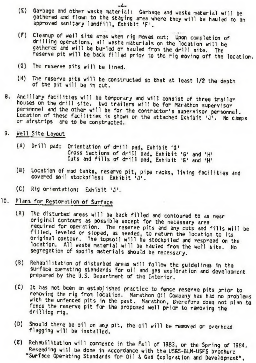
   (A) Cuttings: cuttings will be disposed of in the reserve pit, Exhibit 'G'.

   (B) Drilling fluids: drilling fluids will be disposed of in the reserve pit, and then flown to the staging area by helicopter where it will be transferred to a truck and disposed of in the Oregon Basin Field, Exhibit 'G'.

   (C) Produced fluids will be gauged on the site and flown by helicopter to the staging area where it will be loaded onto a truck and trucked to the Oregon Basin Field for treatment. Transfer lease tickets will be made prior to shipping the oil from the location.

   (D) Sewage: Sewage, of which there will be very little, will be disposed of in portable self-contained sanitary units. Exhibit 'J'.

APPENDIX B



(E) Garbage and other waste material: Garbage and waste material will be gathered and flown to the staging area where they will be hauled to an approved sanitary landfill, Exhibit 'F'.

(F) Cleanup of well site area when rig moves out: Upon completion of drilling operations, all waste materials on the location will be gathered and will be buried or hauled from the drill site. The reserve pit will be back filled prior to the rig moving off the location.

(G) The reserve pits will be lined.

(H) The reserve pits will be constructed so that at least 1/2 the depth of the pit will be in cut.

8. Ancillary facilities will be temporary and will consist of three trailer houses on the drill site. two trailers will be for Marathon supervisor personnel and the other will be for the contractor's supervisor personnel. Location of these facilities is shown on the attached Exhibit 'J'. No camps or airstrips are to be constructed.

9. Well Site Layout

(A) Drill pad: Orientation of drill pad, Exhibit 'G'
Cross Sections of drill pad, Exhibit 'G' and 'H'
Cuts and fills of drill pad, Exhibit 'G' and 'H'

(B) Location of mud tanks, reserve pit, pipe racks, living facilities and covered soil stockpiles: Exhibit 'J'.

(C) Rig orientation: Exhibit 'J'.

10. Plans for Restoration of Surface

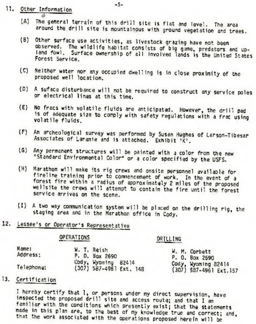
(A) The disturbed areas will be back filled and contoured to as near original contours as possible except for the necessary area required for operation. The reserve pits and any cuts and fills will be filled, leveled or sloped, as needed, to return the location to its original contour. The topsoil will be stockpiled and respread on the location. All waste material will be hauled from the well site. No segregation of spoils materials should be necessary.

(B) Rehabilitation of disturbed areas will follow the guidelines in the surface operating standards for oil and gas exploration and development prepared by the U.S. Department of the Interior.

(C) It has not been an established practice to fence reserve pits prior to removing the rig from location. Marathon Oil Company has had no problems with the unfenced pits in the past. Marathon, therefore does not plan to fence the reserve pit for the proposed well prior to removing the drilling rig.

(D) Should there be oil on any pit, the oil will be removed or overhead flagging will be installed.

(E) Rehabilitation will commence in the Fall of 1983, or the Spring of 1984. Reseeding will be done in accordance with the USGS-BLM-USFS brochure "Surface Operating Standards for Oil & Gas Exploration and Development".



11. Other Information

(A) The general terrain of this drill site is flat and level. The area around the drill site is mountainous with ground vegetation and trees.

(B) Other surface use activities, as livestock grazing have not been observed. The wildlife habitat consists of big game, predators and upland fowl. Surface ownership of all involved lands is the United States Forest Service.

(C) Neither water nor any occupied dwelling is in close proximity of the proposed well location.

(D) A suface disturbance will not be required to construct any service poles or electrical lines at this time.

(E) No fracs with volatile fluids are anticipated. However, the drill pad is of adequate size to comply with safety regulations with a frac using volatile fluids.

(F) An archeological survey was performed by Susan Hughes of Larson-Tibesar Associates of Laramie and is attached. Exhibit 'K'.

(G) Any permanent structures will be painted with a color from the new "Standard Environmental Color" or a color specified by the USFS.

(H) Marathon will make its rig crews and onsite personnel available for fireline training prior to commencement of work. In the event of a forest fire within a radius of approximately 2 miles of the proposed wellsite the crews will attempt to contain the fire until the forest service arrives on the scene.

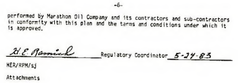
(I) A two way communication system will be placed on the drilling rig, the staging area and in the Marathon office in Cody.

12. Lessee's or Operator's Representative

	OPERATIONS	DRILLING
Name:	W. T. Reish	W. M. Corbett
Address:	P. D. Box 2690 Cody, Wyoming 82414	P. O. Box 2690 Cody, Wyoming 82414
Telephone:	(307) 587-4961 Ext. 148	(307) 587-4961 Ext.157

13. Certification

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill site and access route; and that I am familiar with the conditions which presently exist; that the statements made in this plan are, to the best of my knowledge true and correct; and, that the work associated with the operations proposed herein will be



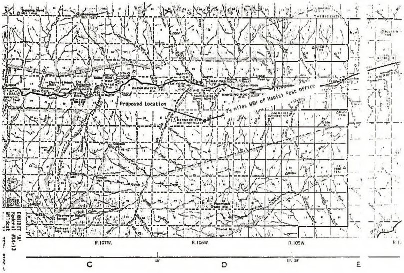
performed by Marathon Oil Company and its contractors and sub-contractors in conformity with this plan and the terms and conditions under which it is approved.

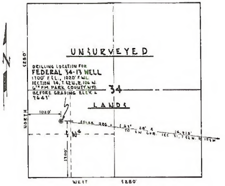
H.E. Ramick Regulatory Coordinator 5-24-83

HER/RPM/sj

Attachments

APPENDIX B




UNSURVEYED
LANDS
34
5280'
NORTH
1020'
1700'
WEST
5280'
SOLAR BRG. = S 83° 28' E TO SW COR. SEC. 31, T. 52 N., R. 105 W.
14,910'

DRILLING LOCATION FOR
FEDERAL 34-13 WELL
1700' F.S.L., 1020' F.W.L.
SECTION 34, T. 52 N., R. 106 W.
6th P.M. PARK COUNTY, WYO.
BEFORE GRADING ELEV. = 7643'

SCALE: 1" = 1000'

1. ELEVATION AT REFERENCE POINT 250' NORTH = 7629.0
2. ELEVATION AT REFERENCE POINT 250' WEST = 7643.1'
3. ELEVATIONS ARE BASED ON AN INITIAL U.S.C.&G.S. ELEVATION OF 5818.8' ON BENCHMARK C-13 OF LEVEL LINE No. 101 NEAR HANGING ROCK.
4. THE SECTION LINES WERE PROJECTED WESTERLY FROM THE SOUTHWEST CORNER OF SECTION 31, T. 52 N., R. 105 W., THIS BEING THE NEAREST MONUMENTATION OF THE U.S. GOVERNMENT LAND SURVEY

CERTIFICATE OF SURVEYOR

STATE OF WYOMING } SS
COUNTY OF PARK }

I, PAUL A. BLOUGH, OF CODY, WYOMING, HEREBY CERTIFY THAT THIS MAP WAS MADE FROM NOTES TAKEN DURING AN ACTUAL SURVEY MADE BY ME OR UNDER MY DIRECTION ON MAY 13, 1963, AND THAT IT CORRECTLY SHOWS THE LOCATION OF THE DRILLING SITE FOR A WELL IN SECTION 34, T. 52 N., R. 106 W. (PROTECTED) OF THE 6TH P.M. WYOMING, AS STAKED ON THE GROUND DURING SAID SURVEY.

WYOMING L. S. REG. NO. 2332

Paul A. Blough
PAUL A. BLOUGH

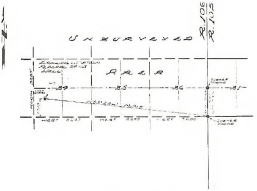
MARATHON OIL COMPANY
P.O. BOX 2690
CODY, WYOMING

MAP SHOWING
DRILLING LOCATION
FOR
FEDERAL 34-13 WELL
IN SECTION 34, T. 52 N., R. 106 W. 6th P.M.
PARK COUNTY, WYOMING (AS PROTECTED)

PREPARED BY:
HOLM-BLOUGH & CO. — CODY, WYOMING
ENGINEERING & SURVEYING MAY, 1963

EXHIBIT 'B'
Federal #34-13
Wildcat
Sec. 34, T52N, R106W

BOOK NO. 144



SCALE: 1" = 2000'

CERTIFICATE OF SURVEYOR

STATE OF WYOMING } SS
COUNTY OF PARK }

I, PAUL A. BLOUGH, OF CODY, WYOMING HEREBY CERTIFY AS FOLLOWS: THAT THIS SURVEY LIES IN AN UNSURVEYED AREA; THAT SECTIONS 34, 35 AND 36 IN T.52N., R.106W. OF THE 6TH P.M. WERE PROJECTED WEST FROM THE SOUTHWEST CORNER OF SECTION 31 T.52N., R.105W. ACCORDING TO THE METHODS OF SURVEY OUTLINED IN THE B.L.M. MANUAL OF INSTRUCTIONS, 1973; THAT THE SOUTHWEST CORNER OF SAID SECTION 31 IS THE NEAREST MONUMENTATION OF THE GOVERNMENT LAND SURVEY; THAT THE BEARING AREA USED FOR THIS SURVEY WAS DETERMINED FROM A SOLAR OBSERVATION; THAT SAID SURVEY IS CORRECTLY REPRESENTED UPON THIS PLAT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

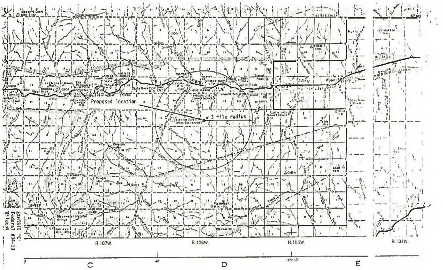
WYOMING L. S. REGISTRATION NO. 2332

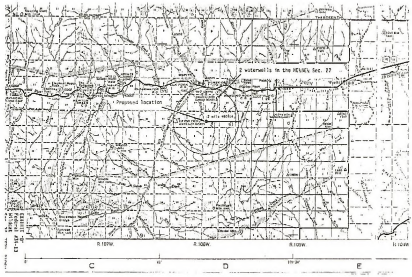
Paul A. Blough
PAUL A. BLOUGH

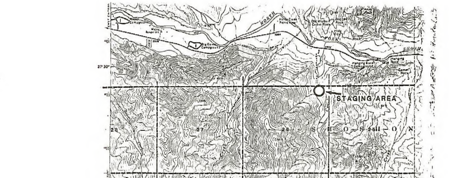
MARATHON OIL CO.
P.O. BOX 2690
CODY, WYOMING
PLAT SHOWING
U.S. GOVERNMENT
LAND SURVEY PROJECTION
AND DRILLING LOCATION
FOR FEDERAL 34-13 WELL
HOLM-BLOUGH CO. — ENGINEERING & SURVEYING
CODY, WYOMING — MAY, 1963

BOOK NO. 144
JOB NO. [illegible]

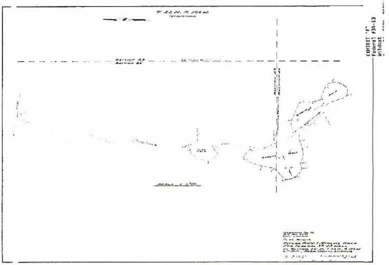
APPENDIX B

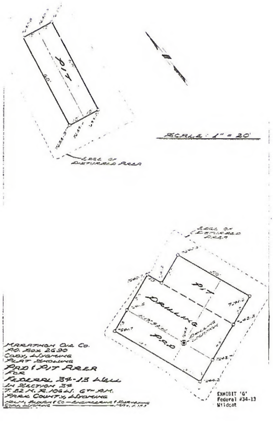

Proposed location
3 mile radius
THIRTEENTH
CLEARWATER
WAPITI
HANGING ROCK
R.107W.
R.106W.
R.105W.
R.104W.
C
D
E
EXHIBIT 'C'
Federal #34-13
Wildcat

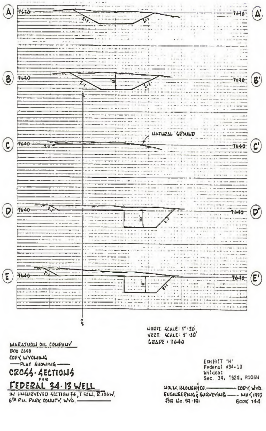

2 waterwells in the NE¼NE¼ Sec. 27
Proposed location
2 mile radius
THIRTEENTH
CLEARWATER
WAPITI
HANGING ROCK
R.107W.
R.106W.
R.105W.
R.104W.
C
D
E
EXHIBIT 'D'
Federal #34-13
Wildcat


STAGING AREA
28
27
26
33
34
35
36
SHOSHONE
NATIONAL
PROPOSED LOCATION
1700'FSL,1020'FWL
Sec.34,T.52 N.,R.106 W.
Temporary Water Line
Proposed Point of Diversion
NORTH FORK
Hanging Rock
EXHIBIT 'E'
Federal #34-13
Wildcat

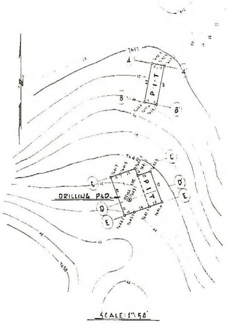
APPENDIX B


T. 52 N., R. 106 W.
Section 27
Section 34
Section 26
Section 35
Scale 1" = 400'
EXHIBIT 'F'
Federal #34-13
Wildcat


PIT
Scale: 1" = 20'
Edge of Disturbed Area
Edge of Disturbed Area
PIT
DRILLING
PAD
Drilling Location
Marathon Oil Co.
P.O. Box 2690
Cody, Wyoming
Plat Showing
Pad & Pit Area
For
Federal 34-13 Well
In Section 34
T. 52 N. R. 106 W. 6th P.M.
Park County, Wyoming
Holm, Blough & Co.—Engineering & Surveying
Cody, Wyoming
EXHIBIT 'G'
Federal #34-13
Wildcat


A
7640
2:1
2:1
7640
A'
B
7640
2:1
10
2:1
7640
B'
C
7640
2:1
NATURAL GROUND
7640
C'
D
7640
2:1
10
2:1
7640
D'
E
7640
2:1
10'
2:1
7640
E'
HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 20'
GRADE = 7640
MARATHON OIL COMPANY
BOX 2690
CODY, WYOMING
—PLAT SHOWING—
CROSS-SECTIONS
FOR
FEDERAL 34-13 WELL
IN UNSURVEYED SECTION 34, T.52N., R.106W.
6th P.M. PARK COUNTY, WYO.
EXHIBIT 'H'
Federal #34-13
Wildcat
Sec. 34, T52N, R106W
HOLM, BLOUGH & CO. — CODY, WYO.
ENGINEERING & SURVEYING — MAY, 1983
JOB No. 83-151
BOOK 144

APPENDIX B



SCALE: 1" = 50'

MARATHON OIL COMPANY
BOX 2690
CODY, WYOMING
—PLAT SHOWING—
PAD AND PIT AREA AND
CROSS SECTION REFERENCE
FOR
FEDERAL 34-13 WELL
IN UNSURVEYED SECTION 34, T.52N, R.106W
6TH P.M., PARK COUNTY, WYO.

HOLM, BLOUGH & CO — ENGINEERING & SURVEYING
CODY, WYOMING — MAY, 1983

JOB # 83-151
BOOK 144

1020' FWL, 1700' FSL
Sec. 34, T52N, R105W
Park County, Wyoming
Elevation: 7643' (Before Grading)

Not Drawn To Scale

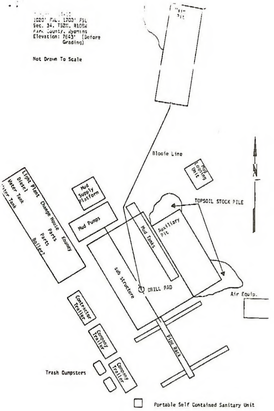
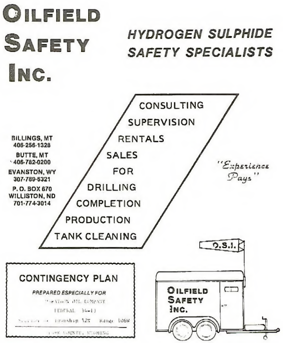


EXHIBIT 'J'
Federal #34-13
Wildcat



OILFIELD SAFETY INC.

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"Experience Pays"

CONTINGENCY PLAN
PREPARED ESPECIALLY FOR
MARATHON OIL COMPANY
FEDERAL 34-13
Section 34 Township 52N Range 106W
PARK COUNTY, WYOMING

OILFIELD SAFETY INC.

CONTINGENCY PLAN

This Contingency Plan was written
specifically for:

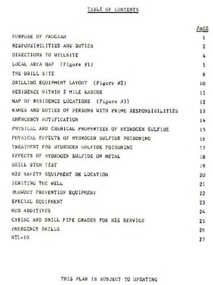
MARATHON OIL COMPANY
BOX 2690
CODY, WYOMING 82414

SAFETY PROGRAM AND EMERGENCY EVACUATION PLAN

FEDERAL 34-13
SECTION 34 TOWNSHIP 52N RANGE 106W
1020' FWL 1700' FSL
PARK COUNTY, WYOMING

O.S.I. P. O. Box 866 Kemmerer, Wyoming 83101 (307) 789-6321

APPENDIX B



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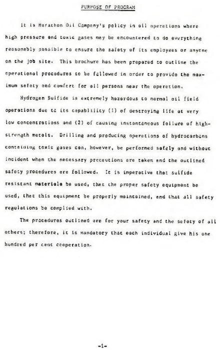
NTL-10	27

THIS PLAN IS SUBJECT TO UPDATING



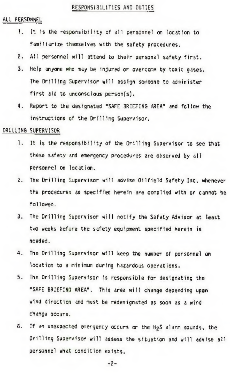
PURPOSE OF PROGRAM

It is Marathon Oil Company's policy in all operations where high pressure and toxic gases may be encountered to do everything reasonably possible to ensure the safety of its employees or anyone on the job site. This brochure has been prepared to outline the operational procedures to be followed in order to provide the maximum safety and comfort for all persons near the operation.

Hydrogen Sulfide is extremely hazardous to normal oil field operations due to its capability (1) of destroying life at very low concentrations and (2) of causing instantaneous failure of high-strength metals. Drilling and producing operations of hydrocarbons containing toxic gases can, however, be performed safely and without incident when the necessary precautions are taken and the outlined safety procedures are followed. It is imperative that sulfide resistant materials be used, that the proper safety equipment be used, that this equipment be properly maintained, and that all safety regulations be complied with.

The procedures outlined are for your safety and the safety of all others; therefore, it is mandatory that each individual give his one hundred per cent cooperation.

-1-



RESPONSIBILITIES AND DUTIES

ALL PERSONNEL

1. It is the responsibility of all personnel on location to familiarize themselves with the safety procedures.
2. All personnel will attend to their personal safety first.
3. Help anyone who may be injured or overcome by toxic gases. The Drilling Supervisor will assign someone to administer first aid to unconscious person(s).
4. Report to the designated "SAFE BRIEFING AREA" and follow the instructions of the Drilling Supervisor.

DRILLING SUPERVISOR

1. It is the responsibility of the Drilling Supervisor to see that these safety and emergency procedures are observed by all personnel on location.
2. The Drilling Supervisor will advise Oilfield Safety Inc. whenever the procedures as specified herein are complied with or cannot be followed.
3. The Drilling Supervisor will notify the Safety Advisor at least two weeks before the safety equipment specified herein is needed.
4. The Drilling Supervisor will keep the number of personnel on location to a minimum during hazardous operations.
5. The Drilling Supervisor is responsible for designating the "SAFE BRIEFING AREA". This area will change depending upon wind direction and must be redesignated as soon as a wind change occurs.
6. If an unexpected emergency occurs or the H_2S alarm sounds, the Drilling Supervisor will assess the situation and will advise all personnel what condition exists.

-2-

7. When it is necessary to secure the location, the escape routes on location will be blocked to prevent anyone from entering the location. Personnel from the rig crew will be used to guard them. There are no access roads to location.

-2A-

APPENDIX B

TEMPORARY SERVICE PERSONNEL

All service personnel, such as cementing crews, logging crews, specialists, mechanics, and welders will furnish their own safety equipment as required to comply with OSHA and Marathon Oil Company's DRILLING FOREMAN.

VISITORS

1. VISITORS will be restricted, unless accompanied by the Marathon Oil Company's DRILLING FOREMAN when Hydrogen Sulfide might be encountered.
2. VISITORS and non-essential personnel will be prohibited from remaining in or entering contaminated areas where the Hydrogen Sulfide concentration in the atmosphere exceeds 20 ppm.

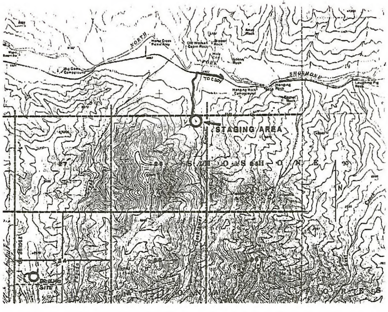
NOTE: WHEN HYDROGEN SULFIDE MIGHT BE ENCOUNTERED NO PERSONNEL ON LOCATION WILL BE PERMITTED TO SLEEP IN VEHICLES.

-3-

DIRECTIONS TO FEDERAL 34-13

The access road turnoff to the staging area is approximately 27 miles west of Cody on highway 14, 16 & 20. The staging area is ½ mile south of the highway on Clock Tower Creek. Crews and equipment will be flown from the staging area 2.4 miles SW to the proposed wellsite.

-4-



APPENDIX B

THE DRILL SITE

The location as shown in Figure 2 is planned in order to obtain the maximum safety benefits consistent with the rig configuration, well depth, and prevailing winds.

1. Through the use of several maps, the area within a two-mile radius of the location has been surveyed and contacts with all permanent residents will be made. Except in a dead calm and a tremendous release of high concentration gases, the probability of lethal dosages beyond one mile is extremely unlikely. Note on the rig layout plat, Figure 2, the direction of prevailing winds.
2. The location of houses, schools, roads, and anything where people may be present and who might need to be warned or evacuated in a crisis have been surveyed. This information with names and telephone numbers are keyed and listed on page 11 and Figure 3 for use if evacuation might be necessary should any emergency develop.
3. The drilling rig, see Figure 2, will be situated on such a location that prevailing winds blow across the rig toward the flare pit.
4. Two (2) SAFETY BRIEFING AREAS will be established not less than 200 feet from the wellhead and in locations so that at least one area will be up-wind of the well at all times.
5. Protecive equipment will be stored in a safety trailer located at one of the BRIEFING AREAS. Such equipment will include air packs and masks, first aid kits, eye wash station, stretchers, hydrogen sulfide hand operated detectors and resuscitators. In the event of an emergency, personnel should assemble at the up-wind BRIEFING AREA for instructions from their supervisor.

6. Wind socks or streamers will be utilized to give wind directions at several elevations; i.e., tree top, derrick floor level, and 6 to 8 feet above ground level. PERSONNEL SHOULD DEVELOP THE PRACTICE OF ROUTINE OBSERVATION OF WIND DIRECTION.
7. All windbreakers and rig curtains will be removed from around the derrick floor and monkey board, whenever H_2S is encountered.
8. Explosion proof ventilating fans (bug blowers) will be positioned to ensure adequate circulation at the monkey board, derrick floor, cellar area, shale shaker, and any other location were hydrogen sulfide might accumulate and need to be dissipated.
9. A kill line of ample strength, securely staked, will be laid to the wellhead from a safe location to permit pumping into the well in an emergency.
10. When approaching a depth where Hydrogen Sulfide may be encountered, the MUD WILL BE MAINTAINED IN AN OVERBALANCED CONDITION TO PRECLUDE THE ENTRY OF FORMATION FLUIDS INTO THE WELLBORE IF MUD IS USED and thereby restrict the Hydrogen Sulfide to be treated to that contained in the formation drilled. Oxygen scavanger and/or H_2S scavanger can be injected into the air system if the air system is being utilized.
11. When approaching a depth where Hydrogen Sulfide may be encountered, appropriate warning signs will be posted around the perimeter of the location and at the foot of all stairways to the derrick floor.
12. Reliable 24-hour radio and/or telephone communication will be available at the rig. Emergency telephone numbers will be prominently posted: Sheriff's Department, Ambulance, Hospitals, Doctors, and Operators' Supervisory Personnel.

13. Filter-type gas masks are not suitable for use on drilling rigs. pressure demand, airpack type masks will be provided for use in any Hydrogen Sulfide concentration. The pressure demand, airpack types have alarms that signal when the air supply is getting low. They are easily and quickly serviced with replacement bottles. They are not physically exhausting to use, are rugged and dependable, and require little maintenance.
14. Masks will be stored on racks and protected from the weather. Rig crew equipment will be located at readily accessible location on the rig floor. Sufficient masks will be stored in safety sheds for every person working in the area. No more than 15 people are expected at one time. For hygienic reasons, masks are to be washed and sterilized at regular intervals. Employees working derricks will be equipped with a connection through a quick-disconnect from his system of breathing air so that if he must evacuate the derrick, he will have a full air bottle with his mask. Two five - outlet air supply manifolds will be installed on the rig floor for continuous use by crews and supervisory personnel working in a "masks-on" situation. The multi-bottle supply cylinder is to be located approximately 200 ft. from the well. A minimum of 3,000 cu.ft. compressed breathing air will be on location at all times.
15. An alarm system which can be heard during operations and which can be activated from several points if gas is detected will be installed. When the alarm is sounded, personnel must put on masks or move to the BRIEFING AREA designated as safe.

16. There will be No Smoking on rig floor or near Wellhead. Designated Smoking Areas will be provided by your Supervisor.
17. Safety meetings and training sessions will be held at frequent intervals by the Safety Advisor, the Drilling Supervisor, or the Rig supervisor. All persons required to work on location will be thoroughly familiar with the use, care and servicing of the following: Personal protective equipment, resuscitation equipment, and gas detection equipment. New employees and those who are present on sporadic basis (i.e. geologists, engineers, service personnel, etc.) will be indoctrinated in the location and use of personal equipment before commencing work.
18. All electric lighting, wiring and electrical devices within 100 feet of the well will be put in vapor-proof condition to minimize the possibility of explosion.
19. Blowout preventers, particularly the ram carrier rods, will be trimmed for hydrogen sulfide service. Choke manifolds will be of similar materials.
20. Inspection, operation, and testing of blowout preventers, choke manifolds, etc., will be conducted regularly.
21. An accurate bottom hole location by use of multishot and single shot directional surveys will be maintained so that, if necessary, the well can be intercepted.
22. Every person involved in the operation will be informed of the characteristics of Hydrogen Sulfide and its dangers, safe procedures to use when it is encountered, and recommended first aid procedures. This will be done through frequent safety talks and training sessions.
23. Personnel with punctured ear drums shall not be permitted to work in an H_2S atmosphere

APPENDIX B

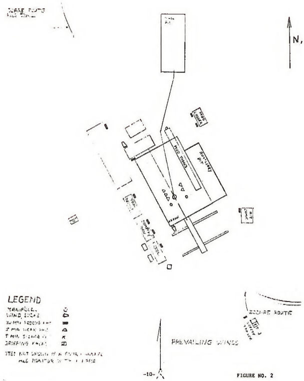


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FIGURE NO. 2

PAGODA CREEK CABIN OWNERS

I	Jeff L. Metzler Box 598 Powell, Wyoming 82435	754-2009 587-3796 (Cabin)
H	Benjamin Chapman 407 Jackson Lexington, VA 24450	703-463-6862
G	Keith J. Neville 1402 Sheridan Avenue Cody, Wyoming 82414	587-6965
F	James Wyllie North Fork Star Route Cody, Wyoming 82414	587-3714
E	Darvin Dietz 775 Road 8 Rt. 1 Powell, Wyoming 82435	754-5405
*D	Frank E. Prosser #69 Forest Road North Fork Star Route Cody, Wyoming 82414	587-2029
C	Kenneth Johnson 435 N. Douglas Powell, Wyoming 82435	754-4240
B	George W. Tresler Box 1060 Cody, Wyoming 82414	Unlisted Home Work 587-2101
A	Evelyn J. Lewis Rt. 2 Box 52 Powell, Wyoming 82435	754-2390

*Indicates the only permanent resident on Pagoda Creek.

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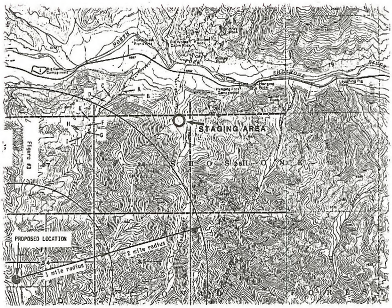
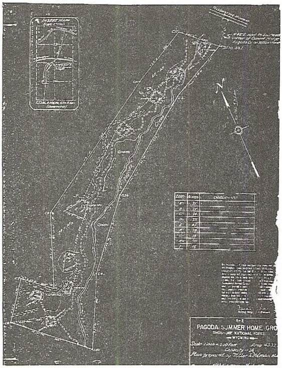


APPENDIX B



NAMES AND DUTIES OF PERSONS WITH PRIME RESPONSIBILITIES

A. MARATHON OIL COMPANY - DRILLING

Jack Fowler	District Operations Manager	Box 2690 Cody, WY 82414
Business Phone	(307) 587-4961	
Home Phone	(307) 587-4334	
Jim Messer	District Engineer	Box 2690 Cody, WY 82414
Business Phone	(307) 587- 4961	
Home Phone	(307) 587-5217	
Bill Corbett	Drilling Superintendent	Box 2690 Cody, WY 82414
Business Phone	(307) 587-4961	
Home Phone	(307) 587-6655	
Ray Kleiv	Drilling Engineer	Box 2690 Cody, WY 82414
Business Phone	(307) 587-4961	
Home Phone	(307) 587-4835	
Bruce Caddy	Drilling Supervisor	Box 2690 Cody, WY 82414
Business Phone	(307) 587-4961	
Home Phone	(307) 587-2652	

B. MARATHON OIL COMPANY - COMPLETION

Jack Fowler	District Operations Manager	Box 2690 Cody, WY 82414
Business Phone	(307) 587-4961	
Home Phone	(307) 587-4334	
Jim Messer	District Engineer	Box 2690 Cody, WY 82414
Business Phone	(307) 587-4961	
Home Phone	(307) 587-5217	
Dave Smith	Big Horn Basin Operation Superintendent	Cody, Wyoming
Business Phone	(307) 587-4961	
Home Phone	(307) 587-5966	
Dan Snelling	Completion Engineer	Cody, Wyoming
Business Phone	(307) 587-4961	
Home Phone	(307) 587-5140	

B. MARATHON OIL COMPANY - COMPLETION (Continued)

Bruce Caddy	Completion Supervisor	Cody, Wyoming
Business Phone	(307) 587-4961	
Home Phone	(307) 587-2652	

C. OILFIELD SAFETY INCL

Jim O'Kane	Wyo. Dist. Manager Superintendent	P. O. Box 866 Kemmerer, Wyo. 83101
Business Phone	(307) 877-9030	
Home Phone	(208) 847-2575	
C. Eugene Roth Jr.	President	P. O. Box 670 Williston, ND 58801
Business Phone	(701) 774-3014	
Home Phone	(701) 572-8973	

D. BUREAU OF LAND MANAGEMENT

Tom Enwright	Resource Area Manager
Business Phone	(307) 587-2216

EMERGENCY NOTIFICATION

LOCAL OFFICIALS AND MEDICAL

CODY, WYOMING

FIRE	911 or (307) 587-5524
POLICE	911 or (307) 587-5524
SHERIFF	911 or (307) 587-5524
HOSPITAL/AMBULANCE	(307) 527-7501
HELICOPTER	(307) 527-7501
VETERINARIAN	(307) 587-3151
BUREAU OF LAND MANAGEMENT	(307) 587-2216

POWELL, WYOMING

AMBULANCE	(307) 754-2267
FIRE	(307) 754-2211
CITY POLICE	(307) 754-2212
SHERIFF	(307) 754-2214
HOSPITAL/AMBULANCE	(307) 754-2267
VETERINARIAN	(307) 754-4192

APPENDIX B

PHYSICAL AND CHEMICAL PROPERTIES OF HYDROGEN SULFIDE H2S

1. Extremely toxic (almost as toxic as Hydrogen Cyanide and 5 to 6 times toxic as Carbon Monoxide).
2. Colorless.
3. Offensive odor, often described as that of rotten eggs.
4. Heavier than air - specific gravity 1.189 (Air = 1.000 @ 60 F.). Vapors may travel considerable distance to a source of ignition and flash back.
5. Forms an explosive mixture with a concentration between 4.3 and 46 percent by volume with auto-ignition occurring at 500 F.
6. Burns with a blue flame and produces Sulfur Dioxide (SO2), which is less toxic than Hydrogen Sulfide but very irritating to eyes and lungs and causes serious injury.
7. Soluble in both water and liquid hydrocarbons.
8. Produces irritation to eyes, throat and respiratory system.
9. Threshold Limit Valve (TLV) - Maximum of eight hours exposure.
10. Corrosive to all electrochemical series metals.
11. Boiling Point (-79 F).
12. Melting Point (-177 F).

PHYSICAL EFFECTS OF HYDROGEN SULFIDE POISONING

THE PRINCIPAL HAZARD IS DEATH BY INHALATION. When the amount of gas absorbed into the blood stream exceeds that which is readily oxidized, systemic poisoning results, with a general action on the nervous system. Labored respiration occurs shortly, and respiratory paralysis may follow immediately at concentrations of 700 ppm and above. This condition may be reached almost without warning as the originally detected odor of Hydrogen Sulfide may have disappeared due to olfactory paralysis. Death then occurs from asphyxiation unless the exposed person is removed immediately to fresh air and breathing stimulated by artificial respiration. Other levels of exposure may cause the following symptoms individually or in combinations:

a. Headache
b. Dizziness
c. Excitement
d. Nausea or gastro-intestinal disturbances
e. Dryness and sensation of pain in nose, throat and chest
f. Coughing
g. Drowsiness

All personnel should be alerted to the fact that detection of Hydrogen Sulfide solely by smell is highly dangerous as the sense of smell is rapidly paralyzed by the gas.

TREATMENT FOR HYDROGEN SULFIDE POISONING

INHALATION

As Hydrogen Sulfide in the blood oxidizes rapidly, symptoms of acute poisoning pass off when inhalation of the gas ceases. It is important, therefore, to get the victim of poisoning to fresh air as quickly as possible. He should be kept at rest and chilling should be prevented. If respiration is slow, labored, or impaired, artificial respiration may be necessary. Most persons overcome by Hydrogen Sulfide may be revived if artificial respiration is applied before the heart action ceases. Victims of poisoning should be under the care of a physician as soon as possible. Irritation due to sub-acute poisoning may lead to serious complications such as pneumonia. Under those conditions, treatment by the physician necessarily would be symptomatic. The patient should be kept in fresh air, and hygienic conditions should be watched carefully.

CONTACT WITH EYES

Eye contact with liquid and/or gas containing Hydrogen Sulfide will cause painful irritation (conjunctivitis). Keep patient in a darkened room apply ice compresses to eyes, put ice on forehead, and send for a physician. Eye irritation caused by exposure to Hydrogen Sulfide requires treatment by a physician, preferably an eye specialist. The progress to recovery in these cases is usually good.

CONTACT WITH SKIN

Skin absorption is very low. Skin discoloration is possible after contact with liquids containing Hydrogen Sulfide. If such skin contact is suspected, the area should be thoroughly washed.

EFFECTS OF HYDROGEN SULFIDE ON METAL

Hydrogen Sulfide dissolves in water to form a weak acid that can cause some pitting, particularly in the presence of oxygen and/or carbon dioxide. However, the most significant action of H_2S is its contribution to a form of hydrogen embrittlement known as sulfide stress cracking. Sulfide stress cracking is a result of metals being subjected to high stress levels in a corrosive environment where H_2S is present. The metal will often fail catastrophically in a brittle manner. Sulfide stress cracking of steel is dependent upon and determined by:

a. Strength (hardness) of the steel - the higher the strength, the greater the susceptibility to sulfide stress cracking. Steels having yield strengths up to 95,000 psi and hardness up to Rc22 are generally resistant to sulfide stress cracking. These limitations can be extended slightly higher for properly quenched and tempered materials.

b. Total member stress (load) - the higher the stress level (load) the greater the susceptibility to sulfide stress cracking.

c. Corrosive environment - corrosive reactions, acids, bacterial action, thermal degradation, or low pH fluid environment.

APPENDIX B

DRILL STEM TEST

1. DRILL STEM TESTING of Hydrogen Sulfide zones will be permitted only in daylight hours.
2. All non-essential personnel will be moved to "Safe Briefing Area".
3. Put on air mask before formation fluids are expected at the surface and continue "MASK ON" until flares are lighted and work areas test no more than 10 ppm Hydrogen Sulfide and the area has been declared safe.
4. If warranted, Ammonia Hydroxide (26 Degree B'eaume Aqua Ammonia) will be used for removing Hydrogen Sulfide from tubing or drill pipe after test.
5. Drill Stem Testing or Swabbing Fluids will be channeled through a separator to permit flaring of gas. Flare lines will be equipped with a continuous pilot light.

H_2S SAFETY EQUIPMENT ON LOCATION

(PROVIDED BY SAFETY CONTRACTOR)

1. Safety Trailer with a cascade system of 10-300 cu.ft. bottles of compressed breathing air complete with high pressure manifolds, providing five men approximately 7 hours of breathing air.
2. Low Pressure Air Line (Approximately 1,000 feet depending on location). Equipped with quick connects.
3. Three low pressure maniflods w/5 man outlest, two on rig floor, one at suction tank near mixing hopper.
4. Ten Scott Pressure Pac 11A, 30 minute Pressure demand breathing apparatus NIOSH, MESA and USGS approved.
5. Five Airline breathing apparatus c/w 7 cu.ft. egress cylinders.
6. Five Emergency Escape Unit (Robert Shaw)
7. "TAC" H_2S 3-Channel Monitor for multiple point continuous detection, each monitoring point is capable of activating remote audio and visual alarm system included.
8. One Bendix Gastec, portable hand operated pump type detector with low and high range H_2S and SO_2 detector tubes.
9. One OW2 Portable Oxygen Resuscitators.
10. One 24 Unit First Aid Kit
11. One stretcher
12. One Eye Wash Station
13. Three Wind Socks with poles
14. One High Pressure Compressed Air Refill Hose
15. One H_2S Condition Sign w/Flags
16. Two Briefing Area Signs
17. One Light Explosion Proof
18. One Siren Explosion Proof
19. Traffic Cones as needed.

NOTE: MORE EQUIPMENT WILL BE ADDED IF WELL CONDITIONS REQUIRE.

IGNITING THE WELL

RESPONSIBILITY

THE DECISION TO IGNITE THE WELL IS THE RESPONSIBILITY OF THE DRILLING SUPERVISOR. In the event he is incapacitated, it becomes the responsibility of the Rig Superintendent. This decision should be made only as a last resort and in a situation where it is clear that

1. Human life and property are endangered.
2. No hope exists for controlling the blowout under prevailing conditions at the well.

Notify the Oilfield Safety Inc., office if time permits, but do not delay if human life is in danger.
Initiate first phase of evacuation plan.

INSTRUCTIONS FOR IGNITING THE WELL

1. Two people are required for the actual igniting operation. They must wear self-contained breathing units and have a safety rope attached. One man will check the atmosphere for explosive gases with the Explosimeter. The other man is responsible for igniting the well.
2. Primary method to ignite: 25 mm meteortype flare gun with range of approximately 500 ft.
3. Ignite upwind and do not approach any closer than is warranted.
4. Select the ignition site which is best for protection.
5. Select area for hasty retreat.
6. BEFORE FIRING, check regarding combustible gases.
7. Since Hydrogen Sulfide converts to Sulfur Dioxide, the area is not safe after igniting the well.
8. After igniting, continue emergency action and procedure as before.
9. All unassigned personnel will limit their actions to only those directed by the Drilling Supervisor.

REMEMBER: AFTER WELL IS IGNITED, BURNING HYDROGEN SULFIDE WILL CONVERT TO SULFUR DIOXIDE, WHICH IS ALSO HIGHLY TOXIC. DO NOT ASSUME THE AREA IS SAFE AFTER THE WELL IS IGNITED.

BLOWOUT PREVENTION EQUIPMENT

1. A kill line of ample strength and length will be laid to a safe point to allow pumping into the well in an emergency situation.
2. The closing unit should be located a safe distance form the wellbore and positioned for maximum utilization based on the prevailing wind direction.
3. BOP equipment will be tested in accordance with standard company practice.
4. All equipment will be H_2S trimmed for service in sour gas environments.
5. Refer to 10 point program attached to APO for additional information.

APPENDIX B

SPECIAL EQUIPMENT

1. If a MUD-GAS SEPARATOR is installed, it will be installed with one or more flare lines.
2. Flare lines should be as long as practical (150 feet minimum), securely staked.
3. An automatic Hydrogen Sulfide monitor will be installed with a combination visual and audible alarm system located where it can be seen and/or heard throughout the drilling location. This system will have the capabilities of being activated from several points, which are the rig floor, cellar, end of blooie line when air is used, and/or shaker and mixing hooper.
4. The automatic monitor should be set to trigger the drilling location visual/audible alarms when the Hydrogen Sulfide concentration in the atmosphere reaches 20 ppm. Explosion proof lights and sirens will be provided at or near the rig floor such that all personnel will be subject to visual and audible warning.

MUD ADDITIVES

DRILLING FLUID RECOMMENDATION

MUD TYPE

Prior to drilling a potential pay zone, oxygen and hydrogen sulfide scavengers will be added to the air system. Drilling will be conducted with a rotating head in addition to the 4 component drilling stack listed in the APD.

Materials to mix an overbalanced mud will be on hand, along with necessary additives for all stabilization.

Quantities of 200 sacks each, Zinc Carbonate and Ironite sponge will be stored on location, Sodium Hydroxide will be stored as needed for raising PH.

CASING GRADES ACCEPTABLE FOR H2S SERVICE

CASING GRADE	H2S SERVICE	COMMENTS**
H-40	YES	---
K-55	YES	---
C-75	YES	---
N-80	CONDITIONAL	ABOVE 200 °F
L-80	YES	---
NN-80	YES	---
C-90	YES	---
C-95	YES	---
S-95	NO	ABOVE 200 °F
SOO-95	NO	ABOVE 200 °F
S-105	NO	ABOVE 200 °F
SOO-90	YES	ABOVE 200 °F
P-110	NO	ABOVE 200 °F
S-135	NO	ABOVE 200 °F
V-150	NO	ABOVE 200 °F

* Service conditions for any H2S environment.

** Denotes usable grades above 200 °F.

DRILL PIPE GRADES FOR H2S SERVICE

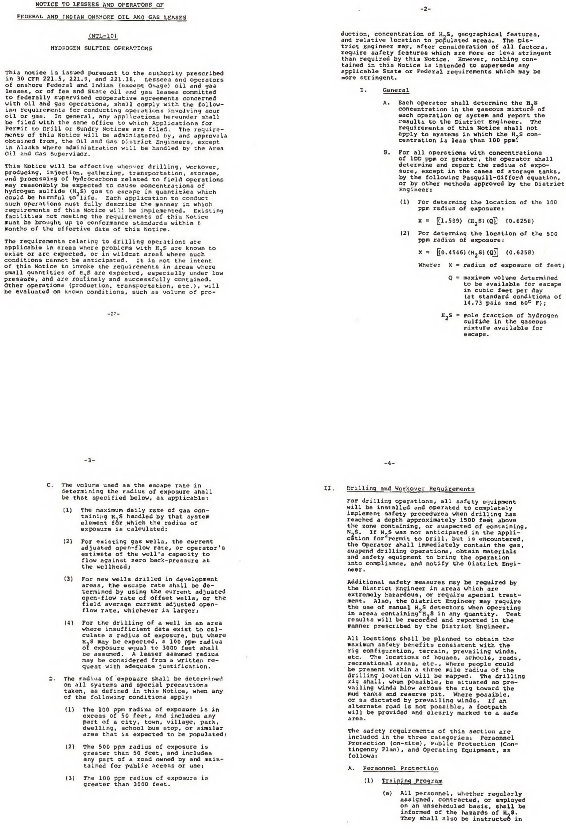
GRADE	H2S SERVICE
D	YES
E	YES
X-95	YES
G-105	NO
S-135	YES
ALUMINUM	YES

EMERGENCY DRILLS

1. Hydrogen Sulfide Alarm Drills

The Safety Advisor will conduct frequent H2S alarm drills for each crew by injecting a trace of H2S where the detectors will give an alarm. Under these conditions all personnel on location will assemble at the "Safe Briefing Area". The Safety Advisor will need to be notified if more personnel are on location than during normal operations. A head count will be taken at this time to determine if rescue operations are indicated. A "Masks On" policy will prevail until the all clear is sounded. These drills will be implemented as frequently as required to familiarize all personnel with the "Drills".

APPENDIX B



NOTICE TO LESSEES AND OPERATORS OF

FEDERAL AND INDIAN ONSHORE OIL AND GAS LEASES

(NTL-10)

HYDROGEN SULFIDE OPERATIONS

This notice is issued pursuant to the authority prescribed in 30 CFR 221.5, 221.9, and 221.18. Lessees and operators of onshore Federal and Indian (except Osage) oil and gas leases, or of fee and State oil and gas leases committed to federally supervised cooperative agreements concerned with oil and gas operations, shall comply with the following requirements for conducting operations involving sour oil or gas. In general, any applications hereunder shall be filed with the same office to which Applications for Permit to Drill or Sundry Notices are filed. The requirements of this Notice will be administered by, and approvals obtained from, the Oil and Gas District Engineers, except in Alaska where administration will be handled by the Area Oil and Gas Supervisor.

This Notice will be effective whenver drilling, workover, producing, injection, gathering, transportation, storage, and processing of hydrocarbons related to field operations may reasonably be expected to cause concentrations of hydrogen sulfide (H_2S) gas to escape in quantities which could be harmful to life. Each application to conduct such operations must fully describe the manner in which requirements of this Notice will be implemented. Existing facilities not meeting the requirements of this Notice must be brought up to conformance standards within 6 months of the effective date of this Notice.

The requirements relating to drilling operations are applicable in areas where problems with H_2S are known to exist or are expected, or in wildcat areas where such conditions cannot be anticipated. It is not the intent of this Notice to invoke the requirements in areas where small quantities of H_2S are expected, especially under low pressure, and are routinely and successfully contained. Other operations (production, transportation, etc.), will be evaluated on known conditions, such as volume of production, concentration of H_2S, geographical features, and relative location to populated areas. The District Engineer may, after consideration of all factors, require safety features which are more or less stringent than required by this Notice. However, nothing contained in this Notice is intended to supersede any applicable State or Federal requirements which may be more stringent.

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I. General

A. Each operator shall determine the H_2S concentration in the gaseous mixture of each operation or system and report the results to the District Engineer. The requirements of this Notice shall not apply to systems in which the H_2S concentration is less than 100 ppm.

B. For all operations with concentrations of 100 ppm or greater, the operator shall determine and report the radius of exposure, except in the cases of storage tanks, by the following Pasquill-Gifford equation, or by other methods approved by the District Engineer:

(1) For determing the location of the 100 ppm radius of exposure:

$$X = \left[(1.589)\ (H_2S)(Q)\right]\ (0.6258)$$

(2) For determing the location of the 500 ppm radius of exposure:

$$X = \left[(0.4546)(H_2S)(Q)\right]\ (0.6258)$$

Where: X = radius of exposure of feet;

Q = maximum volume determined to be available for escape in cubic feet per day (at standard conditions of 14.73 psia and 60° F);

H_2S = mole fraction of hydrogen sulfide in the gaseous mixture available for escape.

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C. The volume used as the escape rate in determining the radius of exposure shall be that specified below, as applicable:

(1) The maximum daily rate of gas containing H_2S handled by that system element for which the radius of exposure is calculated;

(2) For existing gas wells, the current adjusted open-flow rate, or operator's estimate of the well's capacity to flow against zero back-pressure at the wellhead;

(3) For new wells drilled in development areas, the escape rate shall be determined by using the current adjusted open-flow rate of offset wells, or the field average current adjusted open-flow rate, whichever is larger;

(4) For the drilling of a well in an area where insufficient data exist to calculate a radius of exposure, but where H_2S may be expected, a 100 ppm radius of exposure equal to 3000 feet shall be assumed. A lesser assumed radius may be considered from a written request with adequate justification.

D. The radius of exposure shall be determined on all systems and special precautions taken, as defined in this Notice, when any of the following conditions apply:

(1) The 100 ppm radius of exposure is in excess of 50 feet, and includes any part of a city, town, village, park, dwelling, school bus stop, or similar area that is expected to be populated;

(2) The 500 ppm radius of exposure is greater than 50 feet, and includes any part of a road owned by and maintained for public access or use;

(3) The 100 ppm radius of exposure is greater than 3000 feet.

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II. Drilling and Workover Requirements

For drilling operations, all safety equipment will be installed and operated to completely implement safety procedures when drilling has reached a depth approximately 1500 feet above the zone containing, or suspected of containing, N_2S. If N_2S was not anticipated in the Application for Permit to Drill, but is encountered, the Operator shall immediately contain the gas, suspend drilling operations, obtain materials and safety equipment to bring the operation into compliance, and notify the District Engineer.

Additional safety measures may be required by the District Engineer in areas which are extremely hazardous, or require special treatment. Also, the District Engineer may require the use of manual H_2S detectors when operating in areas containing H_2S in any quantity. Test results will be recorded and reported in the manner prescribed by the District Engineer.

All locations shall be planned to obtain the maximum safety benefits consistent with the rig configuration, terrain, prevailing winds, etc. The locations of houses, schools, roads, recreational areas, etc., where people could be present within a three mile radius of the drilling location will be mapped. The drilling rig shall, when possible, be situated so prevailing winds blow across the rig toward the mud tanks and reserve pit. Where possible, or as dictated by prevailing winds. If an alternate road is not possible, a footpath will be provided and clearly marked to a safe area.

The safety requirements of this section are included in the three categories: Personnel Protection (on-site), Public Protection (Contingency Plan), and Operating Equipment, as follows:

A. Personnel Protection

(1) Training Program

(a) All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis, shall be informed of the hazards of H_2S. They shall also be instructed in

APPENDIX B

(1) Contingency Plan

A written contingency plan, providing details of action to alert and protect the public in the event of an accidental release of H_2S, shall be submitted prior to the commencement of operations. The contingency plan must be activated immediately after detection of an accidental release of a potentially hazardous volume of H_2S. The plan will include the following:

(a) The responsibilities and duties of key personnel, and instructions for alerting the public and requesting assistance;

(b) A list of names and telephone numbers of residents and responsible parties of occupied public buildings within the area of exposure;

(c) A telephone call list for requesting assistance from law enforcement, fire department, and medical personnel; this list shall also include State and Federal agencies as required;

(d) A 3-mile radius plat of all private and public dwellings and other areas where the public might reasonably be expected;

(e) In an area of high density population, or in other special cases, the District Engineer, USGS, will require more stringent plans to be developed.

(2) Critical Operations and Curtailment Plans

Certain operations performed under drilling and workover conditions are more critical than others with respect to the containment of potentially hazardous gases; therefore, the District Engineer, U.S. Geological Survey, may require the curtailment of certain operations for the protection of the public. At the time the Application for Permit to Drill is submitted to and approved by the District Engineer, plans for critical

operations will be formulated. Prior to commencement of a critical operation, subsequent notices must be given to the District Engineer.

C. Operating Procedures and Equipment

(1) General Operations

Drilling operations in H_2S areas shall be subject to the folloiwng requirements:

(a) Drill string trips or fishing operations:

Every effort shall be made to pull a dry drill string while maintaining well control. If it is necessary to pull the drill string wet after penetration of H_2S bearing zones, increased monitoring of the working area shall be provided, and protective-breathing apparatus worn.

(b) Circulating bottoms-up from a drilling break, cementing operations, logging operations, or well circulation while not drilling.

After penetration of an H_2S bearing zone, increased monitoring of the working area shall be provided, and protective-breathing apparatus worn by those personnel in the working area at least 15 minutes before and after bottoms-up.

(c) Coring operations in H_2S-Bearing Zones:

Personnel protective-breathing apparatus shall be worn 10-20 stands in advance of retrieving the core barrel. Cores to be transported shall be sealed and marked for the presence of H_2S.

(d) If H_2S-bearing zones are encountered while drilling with air or gas as the circulating medium, the well shall be killed with mud, and drilling continued, using mud as the circulating medium.

(e) Abandonment or temporary abandonment operations:

Internal well-abandonment equipment shall be designed for H_2S service.

(f) Logging operations after penetration of known or suspected H_2S-Bearing Zones:

Mud in use for logging operations shall be conditioned and treated to minimize the effects of H_2S on the logging equipment, or the logging equipment designed for H_2S service.

(g) Gas-cut mud or well kick from H_2S-Bearing Zones:

Protective-breathing apparatus shall be worn when an H_2S concentration of 20 parts per million is detected. Should a decision be made to circulate out a kick, protective-breathing apparatus will be worn prior to and subsequent to bottoms-up, and at any time during an extended kill operation when the concentration of H_2S becomes hazardous to personnel (as defined in paragraphs II.A.(4)).

(h) Drill string precautions:

Precautions will be taken to minimize drill string stresses caused by conditions such as excessive dogleg severity, improper stiffness ratios, improper torque, whip, abrasive wear on tool joints, and joint imbalance. American Petroleum Institute Bulletin RP 7G will be used as a guideline for drill string precautions. Tool-joint

compounds containing free sulphur shall not be used. Proper handling techniques shall be used to minimize notching, stress concentrations, and possible drill pipe failures.

(i) Flare system:

The flare system shall be designed to safely gather and burn H_2S gas. Flare lines will be located as far from the operating facility as feasible, and in a manner to compensate for wind changes. The flare system shall be equipped with a pilot and an automatic igniter; where noncombustible gas is vented, the system must be provided supplemental fuel to burn H_2S.

(j) Kill line:

A kill line of ample strength, securely anchored, shall be laid to the wellhead from a safe location for emergency pumping into the well.

(2) Mud Program

(a) Either water- or oil-base muds are suitable for use.

(b) A pH of 10.0 or above shall be maintained in a waterbase mud system to control corrosion and prevent sulfide stress cracking.

(c) Sufficient quantities of additives shall be maintained on location to add to the mud system to scavenge and/or neutralize H_2S.

(d) Corrosion inhibitors may be applied to the drill pipe or to the mud system as a safeguard, in addition to the protection by pH control mentioned above.

(e) Drilling mud containing H_2S gas shall be degassed at an optimum location for the rig configuration. These gases will be piped into the flara system and burned at a remote location.

(f) The mud shall be maintained in an overbalanced condition to preclude tha antry of formation fluids containing H_2S into the wellbore.

(3) Kick detection and well control

All efforts will be made to prevent a well kick resulting from gas-cut mud, drilling braaks, lost circulation, or trips for bit change.

In the event of kick, the disposal of the well influx fluids will be accomplished by one of the following alternatives, giving consideration to personnel safety, and environmental and equipment damage:

(a) Alternativa A.

To control the kick by using appropriate well-control techniques within the pressure limits of well equipment (drill pipe, casing, wellhead, blowout preventers, etc.). The disposal of H_2S and other gaaes shall be through pressured or atmospheric mud-gas seperator aquipment, depending on volume, pressure, and concentration of H_2S gas. The equipment shall be designed to recover drilling mud, and to vent to the atmosphere and burn the separated gases. The mud system shall be treated to neutralize H_2S and restore and maintain the proper mud quality.

(b) Alternative B.

To contain the well fluid influx by shutting in the well and pumping the fluids back into tha formation.

(4) Testing in an H_2S Environment

(a) Procedures.

(i) Testing shall be performed with a minimum number of personnel in the immediate vicinity of the test using aquipment to

safely and adequately perform the test and maintain related equipment and services. Except with prior approval by the District Engineer, USGS, drill-stem testing of H_2S zones will be conducted during daylight hours only.

(ii) Prior to initiation of the test, special safety meetings will ba conducted for all affected parsonnel, with emphasis on the use of personnel protective-breathing apparatus, first-aid procedures, and Contingency Plan proceduras.

(iii) During tha test, the use of H_2S datection equipment shall be intensified. All producad gases will be vented and burned through a flare system which meats the requirements of paragraph II.C.(1)(j). Gases from stored test fluids will be ventad into the flare system.

(iv) "No Smoking" rules shall be enforced.

(b) Equipment.

(i) Drill-stem test tools, wallhead equipment, and other testing facilities shall be suitable for H_2S servica.

(ii) Tubing which meets the requirements for H_2S service may ba used for drill stem testing. The water cushion shall ba thoroughly inhibited to prevent H_2S corrosion. Tha test string shall be flushed with fluid to neutralize H_2S aftar completion of tha test.

(iii) All surface tast units end related equipment will be designed for H_2S service; only competent personnel, trained in the hazardous

effects of H_2S, shall be utilizad in these tests.

(5) Metallurgical Equipment Considerations

Equipment used in drilling zones bearing H_2S, or in handling production containing H_2S, could be susceptible to the phenomena variously known as: sulfide stress cracking, hydrogen embrittlement, stress corrosion cracking, and/or H_2S embrittlement. To resist or prevent these phenomena, the equipmant will be constructed of material whose matallurgical properties are chosen aftar considering both the working anvironmant and the anticipated stresses. The metallurgical properties include the grade of steel, the processing (rolled, normalized, tempered, and/or quenched), and the rasulting strength properties. The working environment shall include the H_2S concentrations, the well fluid pH, and the well bore preasures and temperatures. For drilling and workover operations, such equipment includes the drill string, casing, wellhead, blowout preventers, kill lines, choke manifold, valves and other related equipment. Each Application for Parmit to Drill and each Notice of Intantion to Workover a well must describe precautions to be taken to protect equipment from H_2S. The following ganeral practices are required for acceptable performance:

(a) Drill string.

Drill stringa shall be designed for the anticipated depth, conditions of the hole, and reservoir environment. Care will be taken to minimize exposure of the drill string to high stresses, as practical and consistent with the anticipated hole conditions.

(b) Casing.

Casing, couplings, flanges, and related equipment shall be designed for H_2S service.

(c) Wellhead, blowout preventers, and pressura control equipment:

The blowout preventer stack assembly shall bs designad in accordance with the lateat state-of-the-art for H_2S service. Surface equipment such as choke lines, choke manifold, kill linas, pressure gauges, bolting, weldments, and other related well-killing equipment shall be designed and fabricated utilizing the most advanced technology for sulfide stress cracking. Elaatomers, packing, and similar inner parts exposed to H_2S must be resistant at the maximum anticipated temperature of exposura.

III. Producing Operations

Except for storage tanks, a determination of the radius of exposure for all production systems shall be made in the manner prescribed in Section I. of this Notice.

A. Storage Tanks

Storage tanks utilized as a part of a production operation and operated at or near atmospheric pressure, where the vapor accumulation has an H_2S concentration in excess of 500 ppm, will be subject to the following:

(1) No datermination of a radius of exposure shall ba mada for storage tanks as herein described.

(2) A warning sign shall be posted on or within 50 feet of the facility to alert the genaral public of the potential danger. The sign shall be painted a high visibility yellow with black lettering, of sufficient size to be readable at a reasonable distance from the facility. The sign shall indicate:

DANGER-POISON GAS - H_2S

(3) Fencing as an additional security measure is required when atorage tanks are located with ¼ mile of a townsite or city, or where conditions cause the

APPENDIX B

the proper use of personnel safety equipment and the use of H_2S detectors and alarms, warning systems, briefing areas, evacuation procedures, and prevailing winds.

(b) A weekly drill and training session shall be conducted and recorded on the driller's log, for all personnel in the working crew. The instruction shall include first aid procedures, maintenance and use of protective breathing equipment, use of retrieval ropes with safety harnesses, and the value of working in pairs.

(c) At least two briefing areas must be designated for assembly of personnel during emergency conditions, located so one is upwind of the well at all times. The most upwind of these will be designated as the "Safe Briefing Area". Personnel should be trained to practice routine observation of wind direction.

(d) One person, who regularly performs duties on the drilling facility, shall be responsible for the overall operation of on-site safety and training programs; he will be designated and identified to all on-site personnel.

(2) Personnel Protective Equipment

(a) All working personnel on a facility shall be equipped with proper protective-breathing apparatus. The operator shall provide such equipment for the normal number of personnel involved in the operation. The operator is not required to furnish protective-breathing equipment for service personnel, but he is required to inform service contractors of the necessity of having this equipment, when called to the location. Lightweight, escape-type

self-contained breathing apparatus with a minimum of 10 minute's supply must be maintained at an easily accessible location for the derrickman, and at any other location where escape from an H_2S atmosphere would be difficult. Additional protective breathing apparatus of the pressure-demand or continuous-flow type (full face piece supplying breathing quality air for an extended period while maintaining a slight pressure inside the system) shall be provided for all essential crew members. Such equipment will conform to Occupational Safety and Health Administration Standards 29 CFR 1910.132, Subpart I, Personal Protective Equipment, and American National Standard Practices for Respiratory Protection Z88.2.

(b) Storage of protective-breathing apparatus shall be planned to assure at least one available apparatus regardless of current wind conditions.

(c) Each system must have an alarm signal for low air supply.

(d) Personnel with punctured ear drums shall not be permitted to work in an H_2S atmosphere.

(e) Additional personnel safety equipment must be available for use:

(i) Chalk boards and note pads for communication;

(ii) First-aid supplies;

(iii) Resuscitators;

(iv) Litter;

(v) Harnesses and lifelines;

(vi) Wind direction socks or streamers.

(3) Hydrogen Sulfide Detection and Monitoring Equipment

Each facility shall have an H_2S detection and monitoring system that activates audible and visible alarms when the concentration of H_2S reaches the threshold limit value of twenty parts per million in air. This equipment must have a rapid response time and be capable of sensing a minimum of five parts per million H_2S in air, with at least three sensing points located at the most critical areas where H_2S might accumulate. The detection system must be intrinsically safe for hazardous locations, and installed, maintained, and calibrated in accordance with the manufacturer's recommendations. Portable H_2S detection will also be available for all working personnel. After H_2S has been detected by any device, frequent inspections of all areas of poor ventilation shall be made. The sense of smell should never be relied upon to detect the presence of H_2S.

(4) Visible Warning System

Equipment shall be installed at prominent locations to indicate wind direction at all times. At least three such wind socks or streamers will be located at separate elevations: i.e., near ground level, rig floor, and treetop height. Operational danger signs shall be displayed on each side of the rig, and at least two rectangular red flags shall be visible to approaching personnel. Each sign shall be painted a high visibility yellow, with black lettering of sufficient size to be readable at a reasonable distance from the facility. The sign shall indicate:

DANGER-POISON GAS - H_2S

and in smaller lettering:

Do Not Approach If Red Flag is Flying.

All signs and flags shall be illuminated under conditions of poor visibility and at night. These signs and flags will indicate the following conditions and requirements:

(a) Moderate danger. When the concentration reaches 20 ppm H_2S, the signs will be displayed. The detection efforts shall be intensified, and steps taken to eliminate or neutralize the condition.

(b) Intermediate danger. When H_2S is determined to be in the 20-100 ppm range, protective-breathing apparatus shall be worn by all working personnel, and all non-working personnel moved to safe areas.

(c) Extreme danger. When H_2S has exceeded 100 ppm concentration, the flags shall be hoisted, in addition to the displayed signs. All non-essential personnel or all personnel (as appropriate) shall be evacuated at this time.

(5) Ventilation Equipment

All ventilation fans shall be explosion-proof and situated in areas where H_2S may accumulate. Moveable fans shall be provided in work areas to disperse H_2S vapors. The rig layout should be planned to achieve maximum benefit from natural ventilation.

B. Public Protection

When the conditions defined in Section I. D. exist, special precautions shall be taken to alert and protect the public, following the accidental release of a potentially hazardous volume of hydrogen sulfide.

storage tanks to be exposed to the public.

(4) All stock tank installations, not currently equipped, shall be converted to closed systems. Such systems will provide methods for gauging, sampling, and determining the temperatures without direct entry into the system, and for containment of vapors by recovery or burning. Alternatives to this requirement will be considered and may be approved by the District Engineer upon written request by the operator; this must include reasons for the variance request and methods for personnel protection.

(5) Stock tank vapors with H_2S concentrations in the 100-500 ppm range are not included in the requirement because of low volume emissions. However, they are hazardous to personnel who must work near the hatch or vent. Therefore, the operator shall provide such personnel with H_2S safety equipment and training, and encourage working in pairs.

B. Other Surface Production Facilities

In the case of fixed surface facilities (other than stock tanks) where the 100 ppm radius of exposure is in excess of 50 feet, warning signs are required. The design and placement of such signs shall conform to paragraph III.A. (2), and be clearly visible on roads which provide direct access to the facility.

Fencing or other security measures are required when such facilities are located within ¼ mile of a townsite, or where conditions cause the facility to be exposed to the public.

C. Personnel Protection

The appropriate personnel safety and protection requirements contained in Section II. A. of this Notice are also applicable to leasehold production operations. A lightweight, self-contained, escape type breathing apparatus will be suitable for personnel who normally work alone. The nature of production operations makes it more vulnerable than drilling or workover operations, by such factors as: a constant threat of H_2S (rather than only after entry into a H_2S zone), personnel working alone, contractors working unsupervised, and leaks which cause a normally safe area to become hazardous, etc. Therefore, the producing operator's responsibility for personnel safety is increasingly critical as the exposure potential increases. Hence, in addition to providing the required protective breathing and detection equipment, wind direction indicators, etc., the operator will provide all personnel with adequate education as to the hazards of handling H_2S, through regularly scheduled and impromptu safety meetings and bulletin board postings.

D. Public Protection

When conditions as defined in Section I. D. exist, a Contingency Plan must be filed with the District Engineer, USGS. The Plan must include all appropriate requirements listed in Section II. B. (1). One such Plan is required per lease or field as specified by the District Engineer. However, the plan must also include alternate actions for the various sub-systems or geographical locations, as necessary, to cover the larger areal limits.

E. Operating Procedures and Equipment

(1) Producing wells, unless produced by artificial lift, must have two master valves, a packer, and corrosion inhibiting fluid. An automatic closing storm choke or surface controlled subsurface safety valve set below 100 feet must be installed. Alternatives to this requirement will be considered and may be approved by the District Engineer upon written request by the operator; this must include reasons for the variance request and methods for personnel protection. In either case, approval of the producing string and associated safety equipment must be obtained prior to installation.

(2) Surface systems must have automatic closing devices to prevent uncontrolled flow in the event of equipment failure.

(3) Materials and equipment used in new construction and modification of facilities must be resistant to hydrogen sulfide stress cracking under their operating conditions.

(4) Existing facilities with no equipment failure from sulfide stress cracking will be considered adequate.

(5) In the event of a failure of any element of an existing system as a result of hydrogen sulfide stress cracking, the incident must be reported to the District Engineer, with plans for the inspection, protection, or replacement of similar elements of the system.

(6) Corrosion coupons or other methods to monitor corrosion rates shall be installed in all systems in which the H_2S concentration is 100 ppm or greater. If prohibitive corrosion rates are detected, the facilities must be protected by an inhibitor or other suitable means.

APPENDIX C

RARE PLANT SPECIES

Dr. Robert Dorn (letter, April 9, 1984) states that "there are also about 20 species of rare plants found in the area that have scientific value (see T. W. Clark and R. D. Dorn (eds.), Rare and Endangered Vascular Plants and Vertebrates of Wyoming, 1981)."

The species of rare plants listed by Dr. Dorn are discussed below:

Antennaria flagellaris. Park County, Wyoming is at the eastern edge of the geographic distribution of this species, which extends to Washington and Oregon.

Carex bigelovii. The only collection is from the Meeteetse Creek, area of Wyoming. This is a Northeastern sedge.

Carex bipartita. An arctic/alpine sedge, known from Alberta, British Columbia, and northern Montana. A few populations are known in the Uinta Mountains of Utah, in Colorado, and in Park County, Wyoming.

Carex deweyana. A Canadian and New England sedge, known from a few places in the Rockies.

Carex incurviformis. An alpine sedge, apparently from Colorado and Park County, Wyoming.

Carex leptalea. A sedge of peat bogs, shores, and wet meadows, ranging from Labrador and Alaska to California and Florida. It is known from Jenny Lake and Third Creek in Teton County, Wyoming.

Castilleja nivea. A famous alpine paintbrush of central and south Montana and the Beartooth Plateau and Absaroka range in Wyoming. It ranges at least as far south as Kirwin and reaches elevations as low as 6,000 feet on the north slopes of Sheep Mountain (Evert).

Deschampsia danthonioides. An annual hairgrass. Its wide geographic range is from British Columbia to Baja California. It occurs in the Beartooth Plateau and in the Absarokas south to at least Kirwin, Wyoming.

Draba glabella and Draba pectinipila. These are two rare mustards of the Beartooth Plateau.

Eritrichium bowardii. A forget-me-not of limestone mountains, Montana and northwest Wyoming.

Festuca baffinensis. An alpine fescue, known from the Beartooth Plateau.

Gentianella propinqua. An Alaskan and Canadian gentian that is known in Wyoming only from Park County.

Haplopappus carthamoides (Pyrrocoma carthamoides). The only collection of this daisy seems to be from the 1800s, in the Sunlight Basin of Wyoming.

Helitrichion hookeri. A grass mainly from Manitoba, Alberta, and North Dakota, with scattered localities in Montana. In Wyoming, Beartooth Plateau, Yellowstone Park, Dead Indian Hill, and Carter Mountain, where it is common above 10,000 feet (Evert).

Juncus biglumis. An arctic/alpine rush from Siberia, Alaska, arctic Canada, Montana (Glacier Park, only), Beartooth Plateau, and Colorado (high peaks).

Kobresia macrocarpa. A very rare sedge: Pikes Peak and Mt. Evans in Colorado and the Beartooth Plateau and the Absarokas in Wyoming. It is apparently strictly alpine.

Linanthus harknessii (Gilia harknessii). Annual herb of the phlox family, mostly from the Cascades and Sierra Nevada, Washington to California. It occurs at scattered locations to the east. The easternmost sites are in Wyoming, in Teton County (Phelps Lake moraine) and Park County.

Orchis rotundifolia. A widespread northern orchid, known in Wyoming from only one site in Sunlight Basin.

Oxytropic podocarpa. This species is known from the Franks Peak area and from one location in the Wind River Mountains.

Phippsia algida is a minute grass of the high arctic and a handful of sites in the Rocky Mountains: the Beartooth Plateau and Mt. Evans, Colorado.

Poa lettermannii is a small alpine bluegrass from British Columbia, Washington, California, Nevada, Utah, Wyoming, and Colorado. In Wyoming it is rare, known from the Beartooth Plateau, Wind River, and Bighorn Mountains.

Potentilla uniflora. Another Beartooth Plateau plant. Siberia and Alaska south in the Rockies to Colorado. It is known from North Fork drainage, the Absarokas and the the Beartooth Plateau in Wyoming.

Ranunculus verecundus. The Beartooth Plateau is apparently the southern limit of the distribution of this plant.

Salix barrattiana. A willow that ranges from Alaska to British Columbia and Alberta; it is known from at least one site in Glacier Park, and from the alpine and subalpine in Park County, Wyoming.

Senecio indecorus. This groundsel (daisy) ranges from California to Quebec. The only known localities for it in Wyoming are in "wet meadows, woods, and bogs" in Park County. It is not an alpine plant.

It seems unlikely that the North Fork Well would seriously affect any of these species. According to Erwin F. Evert (Dec. 10, 1984) "...only one of the 26 species listed (Castilleja nivea) is definitely known to occur in th 39,000 acre study area. 15 of the 26 species listed are members of the arctic-alpine floristic element, plants of this element occur at high elevations in Wyoming usually above 10,000 ft. It appears that less than ⅛ mi. (the top of Clayton Mtn.) in the study area contains habitat suitable for such species. Of these 15 species, only Castilleja nivea (Evert, Vascular Plants of the North Fork Shoshone River Drainage, unpublished MS.) occurs on top of Clayton Mtn. Many of these arctic-alpine species occur in other alpine areas of the N.F. Shoshone drainage."

APPENDIX D

ECONOMIC VALUE OF BIG GAME IN WYOMING

The Wyoming Game and Fish Department places an economic value to the State of Wyoming on each big game animal harvested in Wyoming. Each elk is valued at $1,581.25, each mule deer at $381.38, and each bighorn sheep at $2,549.20 (Wyoming Game and Fish Department, 1983). The total economic value of wildlife impacts would depend on the change in the number of big game animals harvested. That number is unknown for Alternatives I, II and III.

If big game harvest increases, it is argued that economic returns to the State increase. Conversely, if big game harvest declines economic returns also decline. At the extremes, if big game harvest increased or decreased by the number of big game animals potentially influenced by Alternatives I, II and III, economic returns to the State of Wyoming would change by $178,000, $197,000 and $93,000 respectively. There would be an insignificant economic impacts to the state's economy.

The recommended mitigations identified in Chapter III would cause economic returns to the state to increase or decrease by less than $30,000 for Alternatives I and II and less than $50,000 for Alternative III.

APPENDIX E

DEVELOPMENT AND PRODUCTION OF THE EXPLORATORY WELL

INTRODUCTION

The development and production of the exploratory well is not part of the proposed action or alternatives, and no decision concerning development and production will be made by either the BLM or the USFS at this time. An analysis of development is included to provide a perspective of potential cumulative impacts from possible future applications. The consequences of well development would depend on the extent, location, duration, and timing of development and production activities. Consequences are discussed for each alternative except the "no action" since development and production would not occur if alternative IV is selected.

The likelihood of drilling a successful new field wildcat well and completing it as a producer in 1982 was 17.7 percent in North America, For Wyoming Wells, "Exploratory success rate for 1982 was 25.2 percent, up from 21.0 percent in 1981. Drilling resulted in 84 new field discoveries in 1982, up from 61 in 1981. There were 2,062 wells drilled in Wyoming in 1982 compared with 1,705 in 1981. In the Big Horn Basin: During 1982, 41 exploratory wells were drilled in the Big Horn Basin resulting in six oil wells and four gas wells. The success rate for exploratory wells was 24.4 percent. There were three new field discoveries." (TeSelle, R. D., et. al, 1983)

If the well is successful operating plans would be prepared and analyzed prior to any approval or surface disturbance. These plans would be reviewed and an environmental analysis would be made by an interdisciplinary team.

Actions that could occur during the development and production are as follows:

Trail and road construction and reconstruction
Drill site development
Pipeline construction
Placing of pump equipment and tank construction
Electric transmission line construction
Reentry
Liquid waste disposal
Maintenance of existing facilities
Production
Construction and operation of oil treating facilities

Such actions are subject to prior appropriate approvals by Sundry Notice from the BLM and/or FS.

Oil and gas development and production are described in more detail in the *Grass Creek Oil and Gas Leasing Environmental Assessment* (BLM 1978); the *Cody Resource Area Oil, Gas, and Geothermal Environmental Assessment* (BLM 1981); and the *Oil and Gas Exploration Leasing within the Washakie Wilderness Draft EIS* (Shoshone National Forest 1982).

Appendix F lists representative measures that could be recommended to mitigate impacts that are identified in the environmental analysis.

Production facilities could include a road built from the highway to the well site. The road would comply with Forest Service guidelines and engineering requirements.

If the well does not flow naturally oil and gas could be produced by the use of a beam type pumping unit or a submersible pump. A decision on the appropriate pumping device depends on fluid volumes obtained from the well.

An insulated surface pipeline could be installed from the well site to a treating and storage facility located near the highway. The treating and storage facility could be located along the approved road location where it would not be visible from U.S. Highway 14. A power line to the well site could also be installed.

Any produced gas obtained from the well could be transported by pipeline, vented, flared, reinjected back into the producing formation, or used as lease fuel at the treating facility, depending on the volume and composition of the gas. Options which involve venting or flaring will require that the necessary air quality permits are obtained from the Wyoming DEQ. A second well is necessary to reinject gas back into producing formations.

Production facilities would comply with all Federal regulations on vessel spacing. Any produced water would be trucked from the battery location to a water disposal site near Cody, unless the produced volume of water is greater than trucking would economically or physically allow. An alternative would be to reinject the water into a formation of any producing interval or to clean the water to comply with legal discharge limits.

APPENDIX E

ENVIRONMENTAL CONSEQUENCES

Alternative I

Many of the environmental consequences of developing the proposed well for production would be associated with road and pipeline construction. A logical route for a road and pipeline would be similar to the access road described for Alternative II. Consequently, many of the impacts of developing the proposed well would be similar to the consequences of drilling described for Alternative II.

It is difficult to accurately predict the impacts that production would have on geology before the well is completed and actual rates and volumes of production are determined. The amount of oil produced would affect how the well would be developed for production.

Construction of a road and pipeline could result in localized soil loss and permanent impairment of soil productivity similar to that discussed for Alternative II. Where productivity was permanently impaired, a long-term and irreversible change in the vegetation community would probably occur.

If the North Fork Well is developed for production, an additional road location and three possible pipeline routes could affect 17.5 more acres of soil and vegetation.

The soil disturbance associated with road and pipeline construction would affect water quality by increasing sediment (see discussion of Alternative II in Chapter III).

The most significant potential impact on surface water quality comes from oil spills, which generally occur when petroleum is in transit. It is difficult to estimate the likelihood or consequences of an oil spill, but the reported oil spills within the BLM Cody Resource Area between 1976 and 1981 ranged in size from 3,000 to smaller than 5 barrels (Table E-1). There were approximately 1,200 producing oil wells in the BLM Cody REsource Area in 1982. There was an average of about one reported oil spill for every 70 producing oil wells in a six-year period. Although no significant lasting environmental impacts were associated with these spills, the possibility exists for a major spill with lasting effects.

Contamination of groundwater by hydrocarbons after development would be closely tied to the potential of oil spills in areas where shallow groundwater exists. The most critical areas are the floodplain and terrace deposits of the North Fork of the Shoshone River, where most of the domestic wells are located. Oil spills from production facilities such as tanks or pipelines could seep into shallow water-bearing deposits and migrate to domestic wells. Since none of the alternative drill sites are in this area, contamination of water wells by such an accident is possible, but very unlikely. This is primarily because of the dilution capabilities of surface water and groundwater systems between the alternative well sites and domestic wells. However, this does not diminish the requirement that all spills should be isolated and eliminated immediately to prevent transport of oil pollutants into floodplain and terrace deposit areas.

TABLE E-1

Number and Estimated Average Volume of Oil Spills in the Cody Resource Area

Year	Number of Spills/Yr	Estimated Average Volume/Spill (bbls)	Number of Spills to Reach Live Water	Number of Spills Below 5 bbls.	Estimated Average Percent Oil
76	9	140	2	3	98
77	4	400	1	1	—
78	29	180	2	12	20
79	34	120	5	15	01
80	105	60	3	1	05
81	10	130	2	2	10

Production could affect groundwater quality and quantity if water is produced with the oil and discharged into streams. However, any produced water would have to be of better quality than receiving water before it could be discharged. Extraction of water with oil would not affect any aquifer currently being used in the area, but it would reduce groundwater supplies as long as the well was in production.

The effects on wetlands and floodplains are related to the number of roads and pipelines in wetlands and floodplains. Road construction along Pagoda Creek would eliminate the utility of about 60 acres of riparian wetlands and their hydrologic function. The riparian vegetation root matrix would be eliminated, soil characteristics would be altered by compaction and lack of cover, incoming water would no longer be effectively filtered, nutrients would not be cycled, and recharge would be greatly reduced and replaced by direct runoff. The sediment retention potential of streamside zones would be eliminated in disturbed areas, becoming instead a direct source of sediment.

These changes would degrade water quality in adjacent streams by increasing sediment loads and nutrients in the form of dissolved solids or ions absorbed on newly contributed organic and soil materials. Changes in the buffering capacity and in pH of streams could be expected. Decreased subsurface recharge and increased runoff rates would raise stream temperatures and increase erosion and peak flows (Darnell 1976).

In addition, the hydrologic characteristics of 15 acres of floodway in Pagoda Creek would change. The road, or portions of it, could even be washed out during a flood. The occupation of floodplains would increase the potential for safety hazards and property loss. Aquatic habitat could be degraded. Cleared riparian areas and floodplains would be unprotected during the runoff season, and soil stockpiles, drilling fluids, and other materials stored on site could be washed into flood flows.

Fugitive dust emissions would result from building and upgrading 4.2 miles of road, to the well site and from emissions from bulldozers used to build the road, and drill pad. Emissions would also increase from trucks traveling to and from the well site. The increased dust and emissions would be most apparent to people with summer homes along the road access corridor. Dust would be most apparent during construction and reclamation.

Long-term habitat losses associated with road construction, treatment facilities, and pipelines, as well as disturbance associated with operation of the well, would occur annually through the life of the well.

Habitat losses associated with the surface disturbance would be indefinite. Big game displacement would also be indefinite, and those animals that are displaced into already fully occupied habitat would be lost as the populations adjust back to the habitat carrying capacity. The long-term human activity associated with the oil well would increase the chances for direct wildlife mortality through accidents and poaching. Big game mortality would very likely approach the maximum number displaced by Alternative II.

Production would increase the potential for long term effects on fisheries resulting from nonpoint pollution.

Pollutants and toxic substances would affect aquatic biota and trout if concentrations were high enough. Direct mortality or reduced growth and high susceptibility to gill pathogens is likely when trout are exposed to low concentrations (24 micrograms/liter or more) of petroleum hydrocarbons. The effects of pollutants can also be indirect, causing losses of micro- and macrobenthic organisms and thereby decreasing trout numbers and productivity; or the effects can be cumulative (Woodward, et al. 1981). Cumulative effects are most likely to result from toxic chemicals. Fish can assimilate high amounts of toxic substances if they are exposed to low doses over time. However, the residues from these pollutants may be stored in the body; and when the amount accumulated reaches toxic levels, death occurs.

The most detrimental and widespread impacts on fisheries would occur if pit, pipeline, or storage facilities should leak or spill oil. Ravelling on steep slopes, snowpack movements, high seasonal fluctuations in water discharge, and periodic floods increase the frequency and severity of leaks and spills.

The potential for oil activities to affect the grizzly bear would be similar to consequences described for Alternative II, except that the period of potential impact would be longer.

Because of the increased long-term human activity, it is quite likely that eventually a bald eagle or grizzly bear would be killed, either by accident or purposely through poaching. Development and production could also displace grizzly bears from their secure habitat as big game (prey) species are lost or displaced. Human activities and noise associated with machinery, vehicles, or workover rigs could reduce the availability of areas near the drill site and road corridor for big game (prey) species and grizzly bears. The potential would also increase for grizzly bear conflicts with humans working at the well site, especially if bears were attracted by human food and garbage. Construction of a road in the narrow riparian zone of Pagoda Creek would also destroy a small area that produces succulent food for the grizzly bear during the spring.

Some modification could occur on "Distinctive" variety class landscapes. For example, road pipeline, and power line construction in upper Pagoda Creek would affect landscapes judged "Distinctive." An additional 2.5 miles of road would be built on common variety landscapes along the bottom and side slopes of Pagoda Creek and along the ridge between Grace and Pagoda creeks. Restoration potential for about one-third of the total road length is judged poor. This could result in some long-lasting impacts to these landscapes.

Two miles of the road, pipeline, and power lines would placed in landscapes judged to have "low" visual absorption capacity. Since about one-third of this is judged to have poor restoration potential, the impact would be severe on this portion of the landscape. Another 1.3 miles of road would be constructed on landscapes with moderate to high visual absorption capacity and good restoration potential. About 770 acres classified as sensitivity level one would be affected.

Development and production would directly affect about 1,700 acres of semiprimitive nonmotorized recreation setting. Road, pipeline, and power line construction could have lasting, long-term consequences and would permanently change the affected acres from semiprimitive nonmotorized to a roaded natural setting. It is estimated that this would displace recreation use in the area by 50 RVDs of use annually.

Traffic would increase on Highway 14-16-20 and the road up Pagoda Creek. A large number of trucks and other heavy equipment would have to haul material in and out of the area to build the access road to the well site, pipelines, or power lines that would be permitted. After initial construction, the traffic would probably be largely limited to a pumper visiting the well and storage tanks. The estimated increase in traffic would be about 15 large vehicles and 5 small vehicles each week.

The development and production of the North Fork well would not produce significant economic impacts.

To develop a successful well for production, one or two additional fulltime equivalent jobs (FTE) would be required in activities such as workover and roustabout. This would involve a change of less than one percent in employment and income in the mining sector. Since these activities also occur within a relatively short period of time, existing recreation activities probably would not change enough to influence recreation related employment or income. Although the production phase would be relatively stable and long lasting, it is not labor intensive. For example, local individuals might be contracted to serve as pumpers on this and other wells. Since labor to pump one well would amount to less than one FTE employee per year for the life of the well, local direct employment and income associated with production also would be insignificant.

Royalties and taxes on oil and gas production would provide revenues to local government and add to the state and local governments' revenue intake. This would relieve a portion of the state and local tax burden. A severance tax on oil and gas is assessed by the state at 6 percent of the value of products extracted. A portion of this revenue would be returned to local governments. However, production from one well would not have a noticeable effect even on local public revenues.

If oil and gas development should cause recreation use to change from one area to another hunting, fishing, and general recreation related expenditures for gas, food, lodging, equipment, and services could also change. Thus, commercial recreation businesses that use the Pagoda Creek drainage or the well site would either shift their use to another area or experience a decline in business as the demand for recreation use along Pagoda Creek or at the well site shifted to other areas that offer similar experiences.

The property values of summer homes along Pagoda Creek could decline if road, pipeline, or power line construction and use should change the physical setting and adversely affect recreation opportunities nearby.

Since this alternative involves building a road to the well site, some residents would be disappointed, frustrated and resistant. This would be the major social effect associated with this alternative.

Alternative II

Additional surface disturbance associated with developing Alternative II for production would be relatively minor compared to Alternatives I and III. Much of the surface disturbance necessary for development and production would already have occurred before drilling, when the pad and road were constructed. Beyond these, other impacts would be similar to those described for developing Alternative I for production.

Alternative III

Development and production of the Grace Creek site probably would involve constructing a road or pipeline to the well. Construction of either a road or pipeline would have moderate impacts on soils. Approximately 50 percent of a road or pipeline route would traverse terrain and soil conditions where restoration and vegetation potential is extremely poor. Construction in those locations would result in permanent impairment of soil productivity. About 25 percent of the route would have moderate restoration and vegetation potential, and the remaining portion (along Elk Fork) is located on bottomlands and would have high restoration and revegetation potential.

Sediment would go directly into Grace Creek. Road fill would probably encroach into Grace Creek for about ½ mile where the canyon forms a very narrow "V" shaped drainway. The very steep, often vertical, terrain limits road alignment options. The probability of violating legal water standards is very high, and any road would pose severe unmitigable impacts to the water resources.

Long-term impacts on wildlife, fisheries, or threatened and endangered species associated with production facilities and developments would be similar to the impacts described for Alternative I for production. Big game mortality would be expected to approach the maximum number of animals displaced by Alternative III. Habitat would be indefinitely lost through increased surface disturbance.

Because of the increased long-term human activity, it is reasonable to expect that eventually a bald eagle or grizzly would be killed, either accidentally or deliberately.

Potential long-term impacts to the visual resource resulting from road construction would be severe because the road could not be reclaimed without leaving a permanent change in landscape character. Short-term impacts would also be severe.

Environmental impacts to Grace Creek and adjacent landscapes would also affect recreation use in the Elks Fork corridor. The construction of a road, power lines, or pipeline along Grace Creek would have a severe impact on recreation while these facilities were in use, and moderate long-term impacts could occur following restoration.

Impacts to wilderness, transportation, socioeconomics would be similar to those described for Alternative I.

DEVELOPMENT OF THE AREA

Introduction

The development of the area is not part of the proposed action, and no decision concerning future development will be made by either the BLM or the USFS at this time. However, if the North Fork Well is drilled and commercial quantities of oil or gas are discovered, additional APDs may be submitted. Therefore, a discussion of field development is included to provide a perspective of "possible future applications."

The consequences of field development would depend on the extent, location, duration, and timing of development activities. Since it is impossible to anticipate if or exactly how the area would be developed, the discussion of field development is very general.

If any well produces commercial quantities of oil or natural gas, the probability of more wells increases. For every producing well there could be a service road, a supply of power for the pump, and a means of transporting the oil or gas to a processing facility. Development of the area would be characterized by: (1) further exploration, which includes all activities from the decision to explore through the drilling of other wells; (2) operation and maintenance of producing wells; and (3) abandonment after production ceases.

Throughout these stages of development the following activities could occur:

Drill site construction
Drilling
Trail and road construction/reconstruction
Drill site development
Tank construction and placement of pump equipment
Electric transmission line construction
Liquid waste disposal
Maintenance of facilities
Production
Construction and use of oil treating facilities
Secondary and tertiary recovery
Removal equipment
Capping and cementing drill holes and wells
Surface reclamation and restoration

These activities are also described in the *Grass Creek Oil and Gas Leasing Environmental Assessment* (BLM 1978); the *Cody Resource Area Oil and Gas, and Geothermal Environmental Assessment* (BLM 1981); and the *Oil and Gas Exploration Leasing within the Washakie Wilderness Draft Environmental Impact Statement* (Shoshone National Forest 1982).

Mitigation of Effects

Operating plans would be prepared and approved prior to the commencement of any surface-disturbing activity. These plans would be reviewed and an environmental analysis would be made by an interdisciplinary team.

Appendix F lists representative measures that could be recommended to mitigate impacts that are identified in the environmental analysis.

Likelihood

The number of wells and support facilities varies from field to field and depends on the characteristics of the field. For example, in 1982, of the 40 fields in the Cody Resource Area that produced fewer than one million barrels of oil, the number of producing wells ranged from 1 to 39. The average number of producing wells per field was 9. Figure 21 shows the approximate area

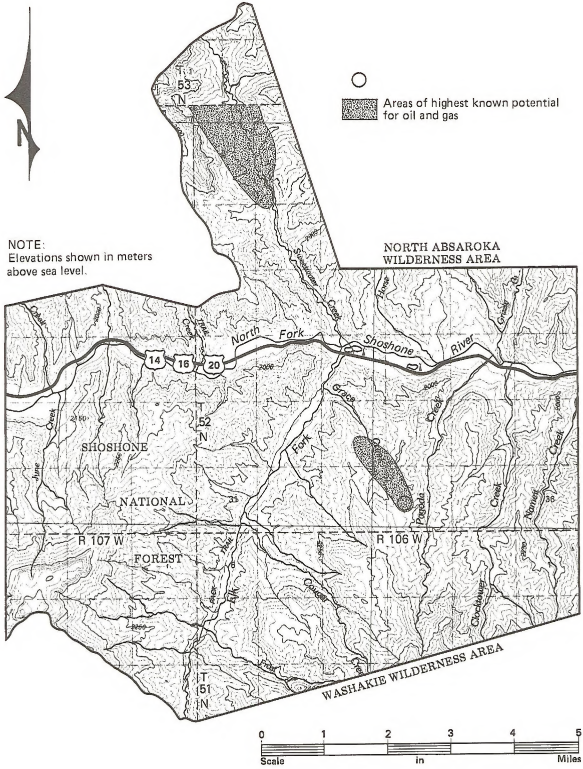

Figure 21
AREAS OF HIGHEST POTENTIAL FOR OIL AND GAS

that has the highest potential for oil and gas development. This information is based on the best available seismic information. However, applications for oil and gas wells and support facilities could occur anywhere in the study area.

The likelihood of drilling a new field wildcat well in the study area and discovering a "significant" sized field is extremely small. Only one of 180 (about ½ of 1 percent) new field wildcat wells in the United States discovered a field estimated to have ultimate reserves of more than 1 million barrels of oil or 6 billion cubic feet of gas (AAPG, Oct. 1983). The North Fork Well is considered a new field wildcat.

The number of wells and other support facilities in "significant sized" fields also varies from field to field. For example, in 1982 the Cody Resource Area had eight fields in this category, and the number of producing wells per field ranged from 40 to 343. The average number of producing wells in these significant sized fields was 148.

Impact thresholds for oil and gas development within the study area (from a surface management standpoint) have not yet been established, since the Shoshone National Forest Land management plan has not yet been completed. This document, scheduled for completion in March, 1985, would establish management goals for the forest, against which potential impacts of field development would be compared. Development would be recommended only to a point that would not compromise these goals. The following economic and social analysis offers an example.

Economics

It is extremely difficult to predict the amount of oil and gas activity that would be likely to occur under full development. Therefore, it has been assumed that a 1 percent increase in total gross output, produced by an increase in the oil and gas sector's output delivered to final demand, would constitute a significant economic impact. A 1 percent increase in total gross output amounts to about $47 million. The business multiplier for the oil and gas sector is 1.3475. This means that it would require slightly less than a $35 million increase in the oil and gas sector to produce the 1 percent change.

A $35 million increase in the oil and gas sector would increase the employment for the four-county region by 188 employees. This would translate into an estimated increase in population of about 350 persons. Furthermore, household income would increase by approximately $2.4 million as a result of the increased production in the oil and gas sector.

Assuming that the price of oil is $28 per barrel and the average production per well is 16,058 barrels per year, slightly more than 77 wells would be needed to produce a 1 percent increase in total gross output.

According to the recreation analysis, some recreation visitor use will be displaced, but may not be lost. Displacing recreation visitor use does not necessarily reduce local recreation expenditures although the volume of some businesses may increase while the volume of other's decrease.

However, if oil and gas development eliminated all recreation use associated with dispersed camping, hunting, horseback riding, and hiking in the study area, an estimated 21,600 recreation visitor days of use would be lost. This would reduce recreation expenditures in the eat/drink, other retail, lodging, and other services sectors by an estimated $956,000 and reduce total gross output by about $2 million.

A $1 million decline in the recreation expenditures would decrease local employment by about 35 employees. This would translate into an estimated decline in population of 65 persons.

The net local economic effect of this hypothetical oil and gas development would be to 1) increase total gross output by $45 million, 2) increase employment by about 150 employees, and 3) increase population by about 285 people.

Social Conditions

Structurally, Cody and Park County would successfully deal with any possible population growth caused by full field development. Prevailing local social conditions preclude significant disruptions. Indeed, additional revenues to the county would be welcomed by many persons, particularly public officials. Other persons would have enhanced job opportunities and prospects for economic gain.

The major cost would be the loss, to many residents both in Cody and in the North Fork Valley, of the area's attributes that are widely considered special. Violation of this proprietary sentiment would be accompanied by additional polarization, dissent, and, among some residents, disappointment and anger.

Until the completion of the Shoshone National Forest land management plan, there will be no established surface resource management threshold values against which to assess the impact of field development proposals. Applications for development facilities would undergo the NEPA process, be judged on their individual merits, and be approved or denied accordingly. The single most important criterion that might result in disapproval of a proposed action would be detrimental effects on a threatened or endangered species.

APPENDIX F

RECOMMENDED MANAGEMENT AND PROTECTION MEASURES

Terms and conditions of developing a well for production would include: (1) approval of an operating plan by the BLM in consultation with the Forest Service prior to entry on the leased lands; (2) possible suspension of activities during periods of adverse climatic conditions that are creating irreparable or extensive damage; (3) protection of cultural and paleontological resources; and (4) protection of endangered or threatened species.

All operators will coordinate their operations in terms of spacing and/or timing to minimize impacts on surface resources and uses.

The Wyoming Game and Fish Department will be consulted before any oil and gas activity occurs on or adjacent to crucial winter range, crucial birthing areas, migration corridors; or near lakes, streams, wetlands, and riparian areas.

The Bureau of Land Management and the Forest Service will provide the level of administration needed to ensure compliance with all terms of the leases, including their attached stipulations and approved operating plans.

The lessee, in exercising the privileges granted by this lease, shall comply with the regulations of the Department of Agriculture and all Federal, State, county, and municipal laws, ordinances, or regulations that are applicable to the area or operations covered by this permit, including, but not limited to, those pertaining to fire, sanitation, fish, and game.

Use of motorized access on new segments of access roads to wells will be limited to personnel of the operator and government personnel making compliance inspections.

Upon abandonment, all fills must be removed from streams and the banks returned to their original slope and configuration. In-channel impoundment will be cleared of sediment and dismantled. All bare soils will be countered and stabilized; damaged stream banks will be planted with willows or equivalent vegetation.

The lessee shall prepare plans for controlling oil or hazardous spills according to the terms of the "Wyoming Oil and Hazardous Substances Pollution Contingency Plan."

Disturbed areas will be limited to the gentlest slopes practical. Erosion hazards will be reduced and the potential for successful rehabilitation will be improved by returning the disturbed area to as gentle a slope as possible before attempting rehabilitation.

Topsoil materials will be stockpiled for use as seedbed during reclamation. The stockpile will be protected during operations from runoff or from other losses due to erosion.

Any area that has a compacted zone near the surface will be mechanically ripped to loosen the compacted zone prior to covering or seeding.

Areas of disturbance will be limited to the minimum amount possible, and erosion, siltation, and sediment control measures will be installed concurrently with construction activities when working in and adjacent to wetland/riparian areas.

Unused wells of any type will be plugged with cement as appropriate to prevent cross-contamination of subsurface water-bearing structures.

Operations will occur at least 100 yards from the high water banks of perennial streams and 100 feet from intermittent channels.

Minimum streamflows will be maintained to protect fish habitat and riparian/aquatic vegetation.

Pits will be lined with removable impermeable plastic or an appropriate sealant. Snow accumulations will be managed to prevent runoff into the pit. Pits will not be constructed in drainageways.

Operations will be conducted outside of wetlands, stream riparian areas, and floodplains except for designated, temporary crossings.

Soil, debris, and all waste materials will not be placed in stream channels.

Non-native species will be seeded initially in reclaimed alpine areas to protect soil productivity until native species can be established.

Any water discharged to the surface will be formally permitted by the appropriate state agency.

Quantities of instream flow and other Forest water rights will not be violated.

Culverts will be designed to accommodate 50-year flows on all crossings that will remain in place through at least one runoff season.

Temporary stream stability structures will be required where access roads cross stream channels and along steep (greater than 20 percent) cutbanks and fill slopes upon the recommendation of the Forest Service interdisciplinary team. Structures will include instream sediment traps installed manually and maintained regularly.

Road crossings will be designed and constructed to allow fish passage and to minimize alteration of natural physical stream characteristics on all perennial streams supporting a seasonal or resident fishery.

Preservation of the natural stream bottom and banks (a bridge or a pipe arch) is required on all Class I or II streams.

Preservation of the natural stream bottom and banks (bridge); or preservation of the natural stream bottom (bridge or pipe arch); or simulated stream bottom (pipe arch or culvert) is required on Class III streams.

Fords (no structure) will be acceptable on any class of stream, but they may be established only under conditions that will not cause a visible change in physical stream characteristics. These conditions are as follows

> bedrock stream bottom and lower banks, or
>
> rubble and/or gravel stream bottom and lower banks, and
>
> weight and number of vehicles anticipated will not cause significant displacement of rubble or gravel.

Culverts and drainage ditches will be installed so that existing drainage patterns are maintained and erosion potential resulting from installation of the structures is minimal.

Instream culverts will be placed so that velocity barriers are not created. Improper placement or sizing of culverts can block the movement of fish if water velocities in the installed structures increase substantially above normal.

Instream culverts will be stabilized with riprapping, planting, or use of excelsior mats to prevent erosion.

APPENDIX F

The operator will install temporary stream crossing structures using the largest fill materials available. Crossings will be removed completely after operations, and stream banks and bottoms will be reclaimed to approximate the original conditions.

Construction on steep hillsides and near watercourses will be avoided where alternate routes provide adequate access.

Cross drainage structures will be located and designed according to standard FS specifications (such as the Packer Guidelines) and will include the use of energy dissipators at each drainage outlet.

No venting or flaring will be allowed without written approval of the BLM's authorized officer. Unrecoverable oil products such as sludges in storage tanks and treaters will be removed and properly disposed of. Separation of liquids will normally be conducted within a closed facility such as a building or a tank so that gaseous vapors will be trapped and prevented from entering the atmosphere. Any venting or flaring of natural gas will require approval from the BLM under NTL-4A.

Only those facilities necessary for the discovery and production of oil and gas will be permitted. Facilities will be painted to blend with surroundings.

Brush piles created by activities will be chopped or crushed and randomly spaced in irregular shapes and sizes if they cannot be removed or buried and are not needed for wildlife.

Rocks left as a result of construction activities shall be randomly spaced in irregularly shaped piles of varying size.

Vegetative clearings for roads, pads, electric lines, pipelines, and other above-ground structures will follow natural vegetation edges and will contain free-form irregular lines and feathered edges.

All motorized equipment will be muffled to limit the noise level to a maximum of 65 decibels when measured 100 feet from the source.

Roads must be surveyed and designed by or under the direct supervision of a registered professional engineer and will be designed with the purpose of fitting the roadway to the terrain.

The operator will construct roads according to plans and specifications approved by the Forest Service. (Forest Service Standard Specifications for the Construction of Roads and Bridges).

The Forest Service will inspect to ensure that each road is properly constructed, at which time control test and charts maintained by the operator must be made available for review. This shall include density tests, aggregate gradations, photographs showing construction techniques, daily diaries, etc.

Access ways will be built to a standard no higher than necessary for safe passage of equipment and support personnel.

The access ways and other areas of operation will be reclaimed, as soon as they have served their purpose, to a condition as near as practical to the surface condition existing prior to the authorized use of the lands.

Cuts and fills will not block natural or known wildlife travel routes.

Roads will be designed and constructed to a minimum right-of-way or crossing distance on natural or known wildlife travel routes.

No road tangents of more than one-quarter mile will be allowed in forested areas.

Roads must be located for minimum impact on elk calving grounds, bighorn sheep lambing areas, bedding areas, winter ranges, migration corridors, or other elk and bighorn sheep concentration sites.

Pipelines will not be located in floodplains or areas subject to mass failure.

All roads and drill sites will be watered or surfaced when necessary to control dust and air pollution.

All trails damaged or lost by road construction must be restored or replaced

All gravel sources will be approved by the Forest Service.

Existing roads will be used whenever possible for access.

When new roads are needed, locations will require FS approval.

Cuts and fills must be constructed to blend with the surrounding landscape through use of slope rounding and other techniques outlined in Agricultural Handbook 483.

Slopes less than 30 percent are favored for road locations.

No vertical alignment gradients will exceed 8 percent sustained grades, unless approved by the Forest Service authorized official.

All debris will be disposed of immediately following road and site construction.

Overhead flagging will be placed over pits to prevent birds from landing in them.

Disturbed areas will be reseeded with plant species desirable for elk, bighorn sheep, deer, and moose.

Facilities such as pits must be fenced to prevent access by game animals and must be sloped on one end to provide escape from drowning or entrapment.

Permits for single purpose roads will contain stipulations that prohibit the carrying of firearms in the vehicles.

If the presence of peregrine falcons is confirmed in the area, oil and gas activities will be regulated to ensure that the species is not being adversely affected. A new biological assessment would need to be prepared.

No activities that would alter cliff structures (potential eyries) on the North Fork drainage will be permitted. The North Fork is the only drainage within the study area with potential for providing the necessary prey base (primarily waterfowl) for peregrines.

All roads built for oil and gas activities must be closed to general public from March 15 to June 15. All new roads in Situation 2 (grizzly bear) lands should be restricted to use by the permittee.

Activities may be temporarily suspended if necessary to resolve a grizzly/human conflict situation. Permittees' (lessees') full cooperation in meeting grizzly management goals and objectives is a condition to holding the permit.

Foodstuffs and garbage will not be allowed to accumulate or to be available to grizzlies.

All activities where humans need to be present will be shut down within 2 miles of a verified wolf sighting until further evaluation is conducted to assess the impacts on the wolf from such activity.

Helicopter flights up or down the North Fork of the Shoshone River drainage should be a minimum of 500 feet above the drainage.

Where practical, large limby trees (perch trees) should not be cut or destroyed.

If bald eagle nesting is found to occur within the study area, oil and gas activities within 1 mile of the nest will be halted during the nesting season (March 1 to July 31) until further evaluation is done as to possible effects.

APPENDIX G

PAGODA CREEK WATERSHED SUMMARY

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                                        SHOSHONE NATIONAL FOREST HYSED REPORT                                       09/29/80
                                                    ALTERNATIVE # 1

                              WATERSHED NAME: PAGODA CR             WATERSHED NO: 5

=====================================================================================================================

AREA ACRES:  2691                  F VALUE:   .7                    BASE SED A:   .48               EXISTING ROAD ACRES:  0
AVG. RUNOFF:  1.13                 YLD INC AcFt:  0                 BASE SED B:  1.15               AVG. AGE EX. RDS 0
BASE YLD:  3040.83                 POST TREAT 3040.83               THRES. SED A+ .94               AVG WATERSHED SLOPE .6
ECA Acres:  0                      ENERGY (1,2,3):  1               THRES. SED B+:  1.2             NEW RD acres:  0

=====================================================================================================================

                                                   WATERSHED SUMMARY

=====================================================================================================================
                          JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC   YR/TOTAL
=====================================================================================================================

BASELINE Ac Ft          48.65    45.61    39.53    87.58   222.59  1083.75   819.81   218.94   170.29   133.8    103.39    66.9
BASELINE Cfs              .81      .76      .66     1.45     3.69    17.96    13.59     3.63     2.82     2.22     1.71     1.11
BASE SED Mg/1             .37      .35      .3       .74     2.15    13.3      9.65     2.11     1.58     1.2       .89      .54
BASE SED Tons             .02      .02      .02      .09      .64    19.35    10.62      .62      .36      .22      .12      .05     32.13
MAX SED Mg/1              .73      .67      .57     1.47     4.5     30.09    21.52     4.41     3.27     2.44     1.79     1.06
MAX SED Tons              .05      .04      .03      .17     1.35    43.78    23.69     1.3       .75      .44      .25      .1      71.94
AL. SED INC.Tns           .02      .02      .01      .09      .7     24.43    13.07      .68      .38      .22      .13      .05     39.81
POST TREAT Ac Ft        48.65    45.61    39.53    87.58   222.59  1083.75   819.81   218.94   170.29   133.8    103.39    66.9
POST TREAT Cfs            .81      .76      .66     1.45     3.69    17.96    13.59     3.63     2.82     2.22     1.71     1.11
POST SED Mg/1             .37      .35      .3       .74     2.15    13.3      9.65     2.11     1.58     1.2       .89      .54
POST SED Tons             .02      .02      .02      .09      .64    19.35    10.62      .62      .36      .22      .12      .05     32.13
SED INC Tons             0        0        0        0        0        0        0        0        0        0        0        0        0

=====================================================================================================================

Pct SEDIMENT INCREASE:  0                MAX ALLOW ECA Acres:  1623.84          Pct WATERSHED AREA:  .6
MAX WTR YLD INC AcFt:  1284.46           Pct OF BASELINE YLD:  .42              ROADS COEF. ADJ FOR SLOPE/AGE:  0
SED YLD FROM ROADS Tons:  0              NEW ROADS Acres:  0                    NEW ROAD COEF.:  2.1
SED YLD FROM NEW ROAD:  0                TOTAL SED YLD Tons/Yr:  0              TOT. SED FROM RDS. & WTR YLD INCR:  0
TOT.PST TRT.SED YLD Tons/Yr:  32.13      EXCESS SED YLD Tons/Yr: -39.81         MAX ALLOW ECA WITH ROADS Acres:  1623.84

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APPENDIX H

THREATENED OR ENDANGERED SPECIES CONSULTATION

United States Department of the Interior

Bureau of Land Management
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003

IN REPLY REFER TO:
6840 (932)

OCT 29 1984

Memorandum

To: Wayne Brewster, Field Supervisor, Office of Endangered Species, Federal Building/U.S. Court House, P. O. Box 10023, Helena, Montana 59626

From: Associate State Director, Wyoming

Subject: Request for Section 7 Consultation--North Fork Oil and Gas Exploratory Well

On March 28, 1984, the Wyoming State Office of the BLM and the Shoshone National Forest transmitted to you a biological assessment and accompanying draft EIS for your review and subsequent biological opinion regarding Marathon Oil Company's Application for Permit to Drill (APD) an exploratory well near Pagoda Creek in Park County, Wyoming. Following public hearings it was determined that the draft EIS should be revised and reissued. We requested verbally and in writing on June 5, 1984, that your staff hold in abeyance their review and biological opinion until such time as BLM and the USFS subsequently revised the DEIS and related biological assessment.

This memo requests your reinitiation of review of the enclosed biological assessment and support documentation for Marathon's APD. The BLM finds a may effect situation to exist with respect to the grizzly bear and bald eagle for all action alternatives. The USFS has attached a single letter indicating differences with or clarification to the biological assessment as it relates to the Shoshone Forest.

Please direct any questions regarding this biological assessment to Dave Roberts of the BLM Worland District Office, (307) 347-9871, or Jim Roseberry at the BLM's Wyoming State Office, FTS 328-2083.

Thompson

	Int.	No		Int.	No
D/M			OPR		
Asst. D/M		1	ADM		1
L & RR		3	Coop/PA		
			P & EA		
Minerals		2			
Received Worland	OCT 30 [illegible]			BLM WY	
Grass Creek			WASH		
			Action		
Lead Resp.			Filing		

Enclosures (2)
1-Biological Assessment
2-Draft EIS

cc:
DM, Worland

BIOLOGICAL ASSESSMENT

for the

NORTH FORK EXPLORATORY
OIL AND GAS WELL
(MARATHON)

on the

SHOSHONE NATIONAL FOREST

Cody, Wyoming

September - 1984

U. S. D. I. - Bureau of Land Management
Worland District
Wyoming

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Attachment: 2nd Draft - North Fork Oil Well EIS

I. Proposed Action and Alternatives

A. Authority

The Endangered Species Act (ESA) directs all Federal agencies to use their authorities to protect endangered species and their habitats. The U. S. Bureau of Land Management (BLM) is required to exercise this authority in two ways: (1) Maintain occupied T/E species habitat and (2) identify and manage (potential) historic habitat for the reestablishment of T/E species populations. Under the Federal Land Policy and Management Act (FLPMA), the BLM must consider wildlife habitat on an equal footing with regard to other land uses. These considerations must be made even in those situations where the BLM is only the subsurface (minerals) administrator.

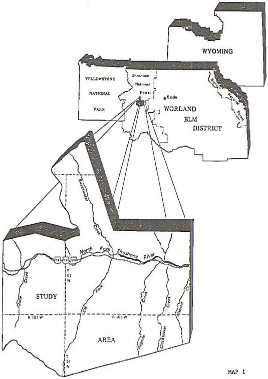
Pursuant to Section 7 of the Endangered Species Act and BLM Instruction Memorandums No. WY-81-327 and WY-82-377, this assessment analyzes the effects of drilling an exploratory oil and gas well on national forest lands in regard to the endangered bald eagle (Haliaeetus leucocephalus alascanus), peregrine falcon (Falco peregrinus anatum), gray wolf (Canis lupus irremotus), and the threatened grizzly bear (Ursus arctos horribilis). This assessment and the recommendations derived therefrom are based on available and accessible information relative to the above species, on knowledge available on oil and gas exploration and development methods, and by reaching professional judgment conclusions regarding the effects of the activities on these four threatened and endangered species.

B. Background

Practically the entire non-wilderness portions of the Shoshone National Forest in the North Fork drainage have been leased for oil and gas exploration and development. Oil and gas leases within this study area (Map 1) were issued by the BLM in 1980 following the decision of the Regional Forester, USFS, to recommend leasing based on the "Environmental Assessment: Oil and Gas leasing of National Forest systems in the Rocky Mountain Region. (1979)". Leases on the national forest incorporate the pertinent stipulations developed in that document.

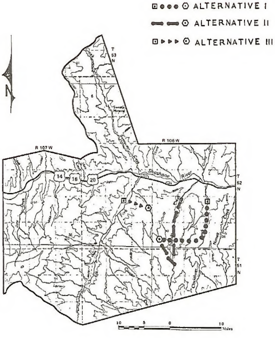
Marathon Oil Company filed an Application for Permit to Drill (APD) an exploratory oil and gas well (North Fork Well) in May 1983. The purpose of this exploratory well, if approved, is to test the underlying geologic structures and to possibly discover new oil and gas reserves. However, this assessment does not include further exploration or development of the reserves, if found, and any such actions would have to undergo additional environmental review under the NEPA process. An EIS is currently being prepared which addresses the alternatives of the Marathon APD (see attachment).

APPENDIX H



MAP 1

GENERAL LOCATION MAP
North Fork Well Study Area



MAP 2
ACTION PROPOSAL ALTERNATIVES

LOCATION OF WELL SITE
North Fork Well

The USFS and BLM may refer to this EIS in responding to any future Applications for Permit to Drill (APDs) in this area. However, a site-specific environmental analysis will be completed for each future application filed.

The biological assessment area, hereafter referred to as the study area, consists of approximately 39,000 acres administered by the U. S. Forest Service within the Shoshone National Forest (Map 1). The area is bounded on the north by the North Absaroka Wilderness and on the south by the Washakie Wilderness. The study area's east boundary is 25 miles from Cody, Wyoming and its west boundary is 19 miles from Yellowstone National Park.

C. Alternatives Considered

1. ALTERNATIVE I: DRILLING THE WELL ON PAGODA CREEK WITH HELICOPTER ACCESS (PROPOSED ACTION)

In Alternative I, Marathon Oil Company proposes to drill a 5,000 feet exploratory oil and gas well in Section 34, T52N, R106W near Pagoda Creek. This site is 2 miles south of U. S. Highway 14-16-20 and 2 miles north of the Washakie Wilderness Boundary (Map 2), at an elevation of 7,643 feet.

Support facilities at the well site include a 2,550 foot long temporary water pipeline from Pagoda Creek to the well site, mud tanks, reserve pits, pipe racks, living facilities and covered soil stockpiles. An area 75 feet by 80 feet will be cleared of all vegetation and graded nearly flat for the drill pad and reserve pit. The pit would be 10 feet deep. The topsoil would be bladed to one side and stockpiled in an area not to be disturbed. Construction materials would consist of soil encountered within the boundary area of the proposed site; that is, on-site materials would be used and no soil material would be flown in. The reserve pit would be constructed by bulldozing and blasting so that at least half the depth of the pit would be below the natural ground line. Impermeable plastic would be used to line the reserve pit and to protect the soil on the drill pad and in the stockpiles. The drilling rig, pipe rack, generator, tool house, living facilities, and drilling mud pump, pit, and supply platform would all be built on the drill pad. A "blooie pit" to contain cuttings and dust encountered in air drilling would be dug with a tracked vehicle and blasted with dynamite. The 60 foot by 20 feet pit would be 10 feet deep and disturb about 0.1 acre north of the drill pad.

Personnel, equipment, and supplies would be trucked to a helicopter staging area on Clocktower Creek about 2 miles northeast of the well site and shuttled to the proposed location by helicopters. Helicopters would fly up Clocktower Creek to the south then west toward the drill site. The staging area would be placed off Highway 16 approximately 1 mile up Clocktower Creek, to an area previously used as a gravel pit. The helicopters would haul an estimated 910 loads and have an estimated flying time of 162 hours during the exploration process.

Lease stipulations prohibit drilling before September 8; therefore, the starting date would be later in the fall. Activity, including construction, drilling, and well completion, would be expected to continue for 2 to 4 months. All activity must be completed by January 1. Approval of this APD would not include approval of production facilities. A separate application for production facilities would be required if the well is a producer.

If potential for oil and gas is low, the well would be abandoned, and all the fresh water, oil, and gas zones must be plugged (isolated) to prevent contamination. The hole would then be cemented off and marked on the surface. The final step would be to reclaim the area until it resembled its original condition as nearly as possible. The reserve pit and any cuts would be filled, leveled, or sloped as needed. Top soil would be respread and the area would be revegetated with a mixture of Idaho fescue, little bluestem and hard fescue. The staging area would be revegetated with such species as basin wild rye, bluebunch wheatgrass, fescues, and possibly some bromes, Lewis flax, and arrowleaf balsamroot. Reclamation of disturbed areas at the well site and staging area would begin in the fall.

In addition to the required stipulations of the lease, the following mitigation measures were recommended in the EIS to help protect T/E species:

a. Lease stipulation C (Part 3) which prohibits any surface use between June 15 and September 7, shall be waived. All drilling and associated activity will begin after June 20 and be completed before December 1 to minimize big game displacement from winter ranges and to reduce potential impacts on grizzly bears.

b. All garbage will be flown to the staging area daily. All garbage will also be hauled from the staging area to a sanitary landfill at least every other day. All food hauled to the drill site and garbage temporarily stored at the drill site or staging area will be stored in containers that would be inaccessible to bears.

c. Crews will not be allowed to carry firearms while working at the drill site or staging area or while traveling to or from the drill site. Marathon Oil Company will be responsible and accountable for enforcement.

d. All human activity during pad construction and pad reclamation will be temporarily stopped or canceled if necessary to resolve grizzly bear/human conflicts.

2. ALTERNATIVE II: DRILLING THE WELL ON PAGODA CREEK WITH ACCESS BY ROAD

Under Alternative II, the well would be drilled at the operator's proposed location, and in the same manner as Alternative I, but access would be by road instead of helicopter. All aspects of drilling would be the same as for Alternative I, except for the following provisions.

An improved 4-mile road (crowned and ditched) would be constructed up the Pagoda Creek drainage to the well site (Map 2). The road would take from 2 to 4 months to construct depending on the number of men and equipment employed. Road construction materials such as gravel, would be available from the old gravel pit along Clocktower Creek, which is the proposed staging area in Alternative I. An estimated 200,000 gallons of water would be pumped from Clocktower Creek and hauled to the road construction site to be used for constructing the road. Reclamation of the road after well abandonment would last at least as long as construction.

All personnel, equipment, and supplies would be trucked to the well site. Water would also be trucked to the well, so no temporary water line would be laid from Pagoda Creek.

In addition to the required stipulations of the lease, the following mitigation measures were recommended in the EIS to help protect T/E species:

a. Lease stipulation C (part 3) which prohibits any surface use between June 15 and September 7, shall be waived. All drilling and associated activity will begin after June 20 and be completed before December 1 to minimize big game displacement from winter ranges and to reduce potential impacts on grizzly bears.

b. All garbage will be hauled from the well site to a sanitary landfill daily. All food and garbage temporarily stored at the drill site will be stored in an airtight container that is inaccessible to bears.

c. Crews will not be allowed to carry firearms while working at the drill site or staging area or while traveling to or from the drill site. Marathon Oil Company will be responsible and accountable for enforcement.

d. All activity during construction or reclamation of the drill pad or access road will be temporarily stopped or canceled if necessary to reduce grizzly bear/human conflicts.

e. Access to the site will be tightly controlled by posting a guard to allow only authorized personnel to access the site by vehicle.

3. ALTERNATIVE III: DRILLING THE WELL ON GRACE CREEK WITH HELICOPTER ACCESS

Under Alternative III, the well would be drilled in Section 28, T52N, R106W. The drill site would be along Grace Creek at an elevation of 6,620 feet (Map 2). The helicopter staging area would be placed along Elk Fork Creek about a mile south of the highway. An improved road to the staging area would be constructed. Helicopter mobilization would be employed as in Alternative I. Since water would be obtained from Grace Creek near the drill site, a short temporary water line would be needed. Water from Elk Fork Creek would be requested as a backup source, and if needed, would be transported by helicopter or temporary pipeline to the well site.

This drill site location is adjacent to Grace Creek near the mouth of a small ephemeral draw. The draw is 100 to 200 feet wide and is bounded by very steep mountain side slopes. The slope of the draw floor is about 15%; the slope of the adjacent mountain side is about 70%. The distance to Grace Creek from the edge of the pad would be about 100 yards.

Personnel, equipment, and supplies would be trucked to the helicopter staging area and transported to the well site by helicopter, pack animal, or by foot.

In addition to the required stipulations of the lease, the following mitigation measures were recommended in the EIS to help protect T/E species:

a. To reduce potential impacts on grizzly bears and big game animals, occupancy during exploration will be limited to the period from June 21 to November 30.

b. All garbage will be flown to the staging area daily. All garbage will also be hauled from the staging area to to a sanitary landfill every other day. All food hauled to the drill site and garbage temporarily stored at the drill site will be stored in a container that would be inaccessible to bears.

c. Crews will not be allowed to carry firearms while working at the drill site or staging area or while traveling to or from the drill site. Marathon Oil Company will be responsible and accountable for enforcement.

d. All human activity during pad construction and pad reclamation will be temporarily stopped or canceled if necessary to resolve grizzly bear/human conflicts.

4. ALTERNATIVE IV: DENIAL OF THE APD (NO ACTION)

For the North Fork Well proposal the "no action" alternative would preclude oil and gas development within the study area. The APD in question would be denied, with the inference that no other APDs would be approved within the study area, since alternate locations and access methods have been analyzed in the EIS. Under the existing base, the "no action" alternative would be authorized only if occupancy would detrimentally affect any endangered or threatened plant or animal species.

5. CUMULATIVE IMPACT SCENARIOS

Though not a part of this Marathon proposal, two possible futuristic scenarios are presented in this assessment in an attempt to address the cumulative impacts if this exploratory well strikes and a field is developed as a result.

a. Development and Production of the Marathon Well

If the well is successful, operating plans would be prepared and analyzed prior to any operating approval or surface disturbance. These plans would be reviewed and an environmental analysis would be made by an interdisciplinary team from the USFS and BLM.

Actions that could occur during the development and production are as follows: trail and road construction and reconstruction; drill site development; pipeline construction; placing of pump equipment and tank construction; electric transmission line construction; reentry; liquid waste disposal; maintenance of existing facilities; production; and construction and operation of oil treating facilities. Such actions are subject to prior appropriate approvals from the BLM and/or USFS.

Production facilities could include a road built from the highway to the well site. The road would comply with Forest Service guidelines and engineering requirements.

If the well does not flow naturally, oil and gas could be produced by the use of a beam type pumping unit or a submersible pump. A decision on the appropriate pumping device depends on fluid volumes obtained from the well.

An insulated surface pipeline could be installed from the well site to a treating and storage facility location near the highway. The treating and storage facility could be located along the approved road location where is would not be visible from U. S. Highway 14. A power line to the well site could also be installed.

Any produced gas obtained from the well could be transported by pipeline, vented, flared, reinjected back into the producing formation, or used as lease fuel at the treating facility, depending on the volume and composition of the gas. These options will require that the necessary air quality permits are obtained from the Wyoming DEQ. A second well is necessary to reinject gas back into producing formations.

Production facilities would comply with all Federal regulations on vessel spacing. Any produced water would be trucked from the battery location to a water disposal site near Cody, unless the produced volume of water is greater than trucking would economically or physically allow. An alternative would be to reinject the water into a formation of any producing interval or to clean the water to comply with legal discharge limits.

b. Oil and Gas Field Development of the Area

If the well is drilled and commercial quantities of oil or gas are discovered, additional APDs may be submitted. The consequences of field development would depend on the extent, location, duration, and timing of development activities. Since it is impossible to anticipate if or exactly how the area would be developed, the discussion of field development is very general.

If any well produced commercial quantities of oil or natural gas, the probability of more wells increases. For every producing well there could be a service road, a supply of power for the pump, and a means of transporting the oil or gas to a processing facility. Development of the area would be characterized by: (1) further

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exploration, which includes all activities from the decision to explore through the drilling of other wells; (2) operation and maintenance of producing wells; and (3) abandonment after production ceases. Throughout these stages of development the following activities could occur: drill site construction; drilling; trail and road construction/reconstruction; drill site development; tank construction and placement of pump equipment; electric transmission line construction; liquid waste disposal; maintenance of facilities; production; construction and use of oil treating facilities; secondary and tertiary recovery; removal equipment; capping and cementing drill holes and wells; and surface reclamation and restoration.

Operating plans would be prepared and approved prior to the commencement of any surface-disturbing activity. These plans would be reviewed and an environmental analysis would be made by an interdisciplinary team. This team would include Forest Service and BLM specialists representing those resource disciplines most directly affected by the proposed action.

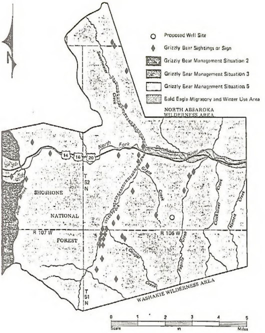
Appendix F of the EIS lists representative measures that could be recommended to mitigate impacts that are identified in the site specific environmental analyses (see attachment).

II. Existing and Potential T/E Species Occurrence

A. Bald Eagle

Migrant bald eagles from Canada and the northern States are found wintering in all of the western states and down the Mississippi River drainage and Great Plains states. Fall migration occurs from September through December. Northward migration to summering/nesting areas generally occurs from March through April. A few bald eagles (probably no more than 5) are seen each year in the North Fork drainage from October through April (Map 3). Most eagles appear to be migrating through the area, particularly in the spring, but there have been a number of observations of eagles wintering in the drainage (Bob Boyle, Jack Saunders, Frank Prossor, Ursula Kepler, Pers. Comm., 1984). There are no known nesting sites in the study area.

Migrating eagles need a food supply during their highly energy-demanding migration. The eagles generally utilize various open areas, open water bodies, and river drainages along their routes to hunt or scavenge for food. The movement inherent in migration allows the eagles some discretion in finding and utilizing feeding sites. Use of a particular migratory route is probably largely influenced by availability of food, adequate cover, adequate perch sites, desirable wind patterns, and some freedom from interference from other species, including man. The North Fork drainage from Elk Fork downstream is open (ice free) at least part of the winter each year such that it could be used by eagles for feeding on fish and/or waterfowl. The area is also winter range for big game and bald eagles very likely could have a food source from scavenging on winter killed big game carcasses.



MAP 3

ENDANGERED AND THREATENED SPECIES
North Fork Well

Bald eagles generally utilize large, old growth trees close to rivers (within 40 meters) and subsidiary drainages as feeding perches on which to rest and view the area for food. Roosting perch trees, utilized mainly for rest and cover during migration, may be found in protected areas, sometime well-removed from feeding areas. Large trees are preferred as perches probably because of the lack of small, cluttering branches and better open view and accessibility provided; stout trees also assure that the eagles weight can be supported. This type of habitat does occur along the North Fork in the study area.

B. Peregrine Falcon

The study area does not appear to provide particularly attractive habitat for nesting (resident) or migrating peregrines and the area is shown in the national forest plan as having no potential for peregrines (Saunders, Pers. Comm., 1984). No known active or historic eyries are found in the area. Waterfowl are the primary prey of peregrines, and waterfowl populations of the North Fork of the Shoshone River drainage are probably too small to constitute a stable prey base, by themselves, for falcons during most of the year. Migrant peregrines moving from nesting/summering areas in Canada and the Northern States to wintering areas farther south are believed to move infrequently through the Shoshone National Forest, although not necessarily the study area. Rare sightings on the Forest during early fall would seem to document occasional use of the Forest by migrant falcons.

C. Gray Wolf

Several status reports were prepared in the early 1970's which addressed the possible occurrence of wolves in the Greater Yellowstone Ecosystem (Jorgensen, et. al., 1970; Cole, 1971; and Herman and Willard, 1976). More recently, Weaver (1978) and Vining (1975) have discussed the possibility of wolves on the Shoshone National Forest. All of these reports lead to the conclusion that there have been no verified sightings of wolves within the study area, although there have been a few sightings of "large canids" on the Shoshone N. F. over the past ten years. Most of the wolf authorities agree, however, that without any sign of packing activity, it is unlikely that a viable population of pure (non-hybrid) grey wolves occurs in the area at this time.

D. Grizzly Bear

The grizzly bear makes uncommon use (by WG&F definition) of the study area (WG&F, 1977). Sightings and sign locations in and around the study area are shown on Map 3.

The grizzly bear uses the study area, particularly during May and June following hibernation, when the bears search for carrion, or weakened and newborn animals on big game winter and spring ranges. Early green-up areas (including stream bottoms and old burns) that provide succulent vegetation are also used during the late spring. Recent information from the Interagency Grizzly Bear Study Team suggests that the lower Elk Fork drainage may be more important to grizzly bears than earlier data indicated (Roop, Pers. Comm., 1984). At least 15 grizzly bear sightings and sign observations were documented in the lower Elk Fork drainage between 1981 and 1984. Six of these observations were of female bears with cubs. An adult grizzly was seen killing an old cow elk near the Forest Service Elk Fork Campground in the spring of 1984 (Oudin and Fagen, 1984). At least four radio-collared grizzly bears have been observed in the study area one or more times between 1981 and 1983. A female grizzly bear was trapped near June Creek in the spring of 1984, and she and three cubs have spent the summer of 1984 on Sheep Mesa in the western portion of the study area. There is evidence that grizzlies also utilize the burn in upper Sweetwater Creek, more so in the spring than in the late fall. The Sweetwater and Elk Fork drainages appear to provide a north/south travel route for some bears, generally in the spring or late fall.

There are no documented grizzly bear dens in the study area; however, there is some indication that at least two boars, both radio-collared animals, denned in the Elk Fork and Sweetwater Creek drainages during the winters of 1980-81 and 1981-82. They were observed immediately before or after denning. The Clayton Mountain area contains habitat components which are thought to be preferred by denning boars (proper elevation, snow cover, and remoteness).

Most of the study area currently lies within grizzly bear management "Situation 5" lands. These lands are defined in the "Guidelines for Management Involving Grizzly bears in the Greater Yellowstone Area" (Mealey, 1979) as lands where -- grizzlies do not occur, or occur only rarely in the area. Habitat may be unsuitable, unavailable, or suitable and available but unoccupied. The "Situation 5" lands lack survival and recovery values for the species, or said values are unknown, and maintenance of suitable and available, but unoccupied, habitat is a management option. A primary goal of the Forest Service will be to manage these "Situation 5" lands in a manner compatible with grizzly use. Since the time when the area was classified as "Situation 5," more data and information has been gathered. It appears that there is more

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bear activity in the North Fork, particularly in the spring, than originally thought. Whether more bears make use of the area now than in past years, or whether more intensive monitoring has merely shown bears to use the area, is unknown. This apparent increased activity may indicate a change in bear activity centers from inside Yellowstone Park to areas outside the park, including the North Fork drainage. Some authorities (Roop, Pers. Comm.) feel the Elk Fork and Sweetwater drainages no longer meet the definition of "Situation 5" lands, and probably need to be up-graded.

The western portion (west of June and Moss Creeks) of the study area, and those lands immediately north and south of the study area, are grizzly bear management "Situation 2" lands where grizzly use occurs, and habitat components needed by the grizzly may be more abundant than in the study area.

III. Review of the Literature and Interviews of Knowledgable Persons

A. Bald Eagle

Several studies have been conducted on the effects of human disturbance on wintering bald eagles. These effects are summarized by Spencer (1976), USDA-FS (1977), Call (1979), and Grubb and Kennedy (1982). There is some disagreement regarding the effects of human disturbance on wintering bald eagles.

McClelland (Pers. Comm. to Falkenstein, 1980) believes that the disturbance by human activities documented for wintering eagles (Stalmaster, 1978; Shea, 1973; Servheen, 1975) applies equally to migrant eagles. In fact, McClelland suggest that such disturbance may be even more significant to migrant eagles since these birds are believed to be under heightened physiological stress due to factors imposed by migration: uncertain quantity and quality of food, uncertain suitable cover and perches, and variable weather conditions. The eagles' ability to move on during migration is a factor which provides some flexibility to minimize human disturbance. The eagles are not tied down during migration to a particular location (as they more or less are in nesting and wintering areas) so they can, and often do move if disturbed. However, McClelland suggests that if human disturbance is so intense and reoccurring during their migration that the cumulative results is to significantly increase stress on the birds, reduced success in migration may occur. (Pers. Comm. McClelland to Falkenstein, 1980).

Call (1979) states that eagles may not be severely affected by aircraft, especially as they hold tight during nesting, however, he recommends that precautions should still be taken when flying around eagle nests and roosts. He does not recommend low level flights, or hovering, around these crucial habitat sites.

Snow (1973) summarizes the effects of shooting as a source of direct mortality to eagle populations. She indicates that shooting mortality, especially in the past when bounties existed, may be a significant impact on some local populations.

For this biological assessment, interviews were made with the following individuals that are familiar with bald eagles in the North Fork area: Jack Saunders, Bob Boyle, Frank Prossor, and Ursula Kepler. Their comments and impressions of potential impacts from the proposal are shown on the interview forms (Appendix).

B. Peregrine Falcon

Several reports have addressed the impacts of human disturbance on peregrine falcons (USDA-FS, 198; RMSPFRT, 1977; USDI-FWS, 1982; Benson, 1979; Snow, 1972; and Call, 1979). All of these authors indicate human disturbance impacts on peregrines to be very similar to those for bald eagles. In summary, falcons are subject to shooting, capture by falconers, accidents, and displacement from suitable habitat by some level of intensity of human activity.

Local knowledgeable persons that were interviewed relative to potential impacts on peregrine falcons in the North Fork were Jack Saunders and Bob Boyle (Appendix).

C. Gray Wolf

Several authors (Jorgensen, et. al., 1970; Cole, 1971; Herman and Willard, 1976; Weaver, 1978; and NRMWRT, 1983) have shown the important connective relationship between wolves and large ungulate (i.e., elk) prey base. It follows, therefore, that any activity that would affect the distribution or survival of this prey base would also impact any wolves that might occur in the same vicinity. Historically, human/wolf conflicts, or even perceived conflicts, have led to the destruction of wolves by shooting, trapping, etc. (Jorgensen, et. al., 1970, Herman and Willard, 1976; and Weaver, 1978). This attitude and situation has existed until very recently in the Rocky Mountain west, and probably still persists in many circles. It is reasonable to expect, then, that any wolf consistently observed around human activity in this area might stand a chance of being killed.

Interviews were conducted with Jack Saunders, John Weaver, and Bob Boyle regarding the potential for any impacts to wolves in this area (Appendix).

D. Grizzly Bear

Schallenberger (1977) and Harding and Nagy (1977) have reported the effects of oil and gas exploration and associated activities on grizzly bears.

Cole (1972) reported that 58 percent of the feeding activities of grizzly bears during the March-May period in Yellowstone National Park was related to feeding or preying on ungulates. Craighead and Craighead (1972) also confirmed that animals weakened by severe winters and carcasses of winter-killed animals formed a considerable portion of the diet of Yellowstone grizzly bears in early spring. Schallenberger (1977) concludes that adverse effects of oil and gas exploitation upon wild ungulate populations could, thus, prove detrimental to grizzly bears. Limited protein availability in the surrounding lands could, in turn, limit grizzly numbers when their demand for animal protein exceeds the supply (Mealey, 1977). At such times, competition among grizzlies for animal food (Cole, 1972) may result in population losses. Dispersal and direct mortality may cause losses among subordinate bears (Stokes, 1970; Martinka, 1976).

Due to the aggressive nature of the grizzly bear, potential bear/human conflicts exist wherever the two occupy the same habitat (Craighead, 1977; and Schallenberger, 1977). Improper disposal of garbage can lead to direct contact, and therefore, confrontations.

Schallenberger (1977) reports on studies which indicated an aversion to aircraft by grizzlies. Harding and Nagy (1977) report similar findings. Helicopters caused the greatest reaction in these studies, and it appeared that marked animals, previously captured through the use of aircraft, tended to have the strongest reaction.

Roads built into a heretofore remote area provide an avenue for additional human intrusion. Schallenberger (1977) reports that an adverse effect is imposed on grizzlies when new roads are built due to increased poaching activities by exploration, drilling, and/or operating crews.

Interviews were conducted with Jack Saunders, John Weaver, and Bob Boyle regarding potential impacts to grizzlies in this area (Appendix).

IV. Anticipated Impacts to T/E Species from the Proposed Action and Alternatives

Evaluation of full field development within the area will be addressed as a cumulative impact scenario. An assumption is that anything less than full field development will generally have less effects on T&E species. The degree or intensity of development will probably correlate to the degree of possible impacts on the species. Use of mitigation measures or recommendations herein will further reduce or eliminate adverse effects. The no action alternative would have no effect on any of the species since habitat conditions or species productivity, survival, or mortality would not be altered from the present state.

Effects which need to be considered include displacement of the T&E species from the area, displacement or loss of prey species from the area, and increased species mortality due to possible poaching or conflict situation resolution. Displacement of T&E species or prey species could occur due to intensive human activity, such as increased noise from machinery, helicopter, vehicle, or drilling, etc., in and around the study area. Loss of vegetation as a food source for the T&E species is not considered to be significant under any of the action proposal alternatives, although it could be a significant cumulative impact in case of field development and production.

A. Bald Eagle

Migrating or wintering bald eagles which use portions of the study area could be disturbed under any of the first three alternatives or the cumulative impact scenarios. Excessive human activity in and near the riparian zone of the North Fork or the lower reaches of tributary drainages during exploration or field development has the potential to displace eagles using the drainages. Continuous helicopter activity within the drainage could result in displacement or abandonment of the area by eagles as well.

Destruction of perch trees (either known or unrecognized) could also make the area less attractive to eagles.

Big game winter loss, and therefore carrion for eagles to feed on, is not expected to be great during the period of proposed exploratory activity in Alternatives I-III. In the cumulative impacts scenarios, however, the extended period of human activity would very likely displace big game from some portions of their traditional winter ranges, and this, in turn, would affect the amount of carrion available for eagles to feed on.

It's possible, though probably not likely if the recommended mitigation is accepted, that an eagle could be poached or accidentally killed by oil field personnel in the context of Alternatives I-III. This event becomes a probability in the case of the cumulative impacts scenarios.

B. Peregrine Falcon

Since the peregrine falcon is not known to occur in the area with any regularity, and since suitable habitat is thought to be minimal in the area, none of the alternatives, or the cumulative impacts scenarios, are expected to have any adverse effects on the species. If a falcon does happen to pass through the area during the period of exploratory or production activity, the impacts would be similar to those on the bald eagle. The chance of this occurring, however, is deemed nil.

C. Gray Wolf

Since the gray wolf is not known to occur in the study area, it is very doubtful whether even full field development would directly affect the species. However, full field oil and gas development could preclude the area from being considered as a suitable area for reintroduction of the species. Prey species (particularly ungulates on winter ranges) would probably avoid the area if the entire study area were developed; in turn, the area would be less valuable to the wolf. Prey species would disperse to other areas in the short run, or overall population levels could decrease in the long term. The wolf, if indeed it were present in the area, would probably adjust to the fluctuations in prey species densities or distribution.

If the wolf were present in the area, the possibility also exists that one or several animals could be shot or killed by accident, especially in the cumulative impact scenarios.

The likelihood of the above impacts on wolves would have to be judged as extremely slim.

D. Grizzly Bear

The effects of oil and gas exploration, possible development, and production in the study area on the grizzly bear largely depend on magnitude, intensity, and timing of the activities. Because grizzly use in the area appears to coincide, in part, with ungulate critical winter range use, it is probable that activities which would significantly effect big game usage of winter ranges would, in turn, effect the grizzly bear's ability to use these areas as well. As big game shifts to other areas to avoid human activity, or is eliminated, less carrion would exist here for grizzlies to feed on in the spring, and as a result, the habitat would be less suitable for the bears. This would likely result in a shift of the bears out of this area also. The probability of effecting the grizzly bear in this manner may be reduced if the exploration activity occurs between June 21st and November 30th instead of September 9th to December 31st.

Since the bears are known, or at least strongly suspected, to use this area during summer and fall also, it is quite likely that the human activity associated with Alternatives I-III will cause some degree of avoidance or confrontation reaction by the bears. This impact would become even more acute in the cumulative impacts scenarios. A grizzly mortality resulting from shooting or accident might possibly occur in the Alternatives I-III, but this circumstance could even be considered probable in the cumulative impacts scenarios. The recommended mitigations of the EIS should help reduce the probability of confrontations between humans and grizzlies.

V. Necessary Studies and Research

A. Bald Eagle

The following information is needed on bald eagles and their habitat in the study area with regard to the action proposals and cumulative impacts scenarios.

1. Continue to monitor (make observations of) bald eagle population parameters and their habitat in the study area.
2. If the oil and gas activity is approved, evaluate the impacts of these activities on the eagle populations and their habitat.

B. Peregrine Falcon

The following information is needed for peregrine falcons and their habitat in the study area in relation to the action proposals and cumulative impacts scenarios.

1. Continue to monitor the North Fork study area for the possible occurrence of peregrine falcons.

Other suggested study needs for peregrines and their potential habitat are outlined in the American Peregrine Falcon Recovery Plan (RMSPFRT, 1977).

C. Gray Wolf

The following information is needed on gray wolves and their habitat in the study area with regard to the action proposals and cumulative impact scenarios.

1. Continue to monitor potential wolf habitat in the study area for the possible occurrence of gray wolves.

Other suggested study needs for gray wolves and their potential habitat are outlined in the Northern Rocky Mountain Wolf Recovery Plan (NRMWRT, 1983).

D. Grizzly Bear

The following information is needed for grizzly bears and their habitat in the study area, particularly in regards to the action proposals and cumulative impact scenarios.

1. Continue to monitor grizzly population parameters and their habitat within the study area.
2. If the oil and gas activities are approved, evaluate the impacts of these activities on the grizzly populations and their habitat.

TABLE 1
Summary of Conclusions of May Affect/No Effect Resulting from the Potential Impacts

Actions T/E Species	ALTERNATIVE ACTION PROPOSALS							CUMULATIVE IMPACT SCENARIOS	
	*ALT. #1		*ALT. #2		*ALT. #3		*ALT. #4	*Production of Marathon Well	*Field Development and Production
	w Recom. Mitig.	wo Recom. Mitig.	w Recom. Mitig.	wo Recom. Mitig.	w Recom. Mitig.	wo Recom. Mitig.			
Bald Eagle	MA	MA	MA	MA	MA	MA	NE	MA	MA
Peregrine Falcon	NE	NE	NE	NE	NE	NE	NE	NE	NE
Gray Wolf	NE	NE	NE	NE	NE	NE	NE	NE	NE
Grizzly Bear	MA	MA	MA	MA	MA	MA	NE	MA	MA

*MA = may affect; NE = no effect

Other suggested study needs for grizzlies and their habitat are outlined in the Grizzly Bear Recovery Plan (USDI-FWS, 1982).

VI. Conclusions and Recommendations

A. Conclusions

Based on the information readily available, the following may affect/no effect determinations are made in response to the action proposal alternatives and the cumulative impacts scenarios. There will be no effect on the peregrine falcon or gray wolf in any of the alternatives or the cumulative impacts scenarios. Alternative IV will have no effect on the bald eagle or grizzly bear. Bald eagles and grizzly bears may be affected by action proposal Alternatives I, II, and III, and the cumulative impacts scenarios, either with or without the recommended mitigation of the North Fork Well EIS. These conclusions are summarized in Table 1.

This biological assessment (BA) will be sent to the U. S. Fish and Wildlife Service (FWS) for formal consultation in accordance with Section 7 of the Endangered Species Act. The FWS will determine whether they agree with the conclusions of this BA, and if so, they will issue a biological opinion (BO) which determines whether or not the "may affect" situations constitute "jeopardy to the continued existence" of the T/E species in question (bald eagle and grizzly bear).

B. Recommendations

If the presence of peregrine falcons or gray wolves is confirmed in the area, or if a conflict appears imminent with bald eagles or grizzly bears, we recommend that oil and gas exploration and development activities be immediately regulated to ensure that the species is not being adversely effected. Consultation should also be reinitiated with the U. S. Fish and Wildlife Service without delay.

It is further suggested, that in addition to the recommended mitigation measures present in the text and appendices of the North Fork Well EIS, the following possible mitigation measures for T/E species be give the fullest consideration in any future oil and gas activities in the study area:

1. Electric powerlines will conform to "Suggested Practices for Raptor Protection on Power Lines...The State of the Art in 1981" where above ground.
2. No surface occupancy associated with exploration (including seismic) and development will occur between December 1 to June 20 in areas of crucial winter range.

APPENDIX H

3. Any activities associated with the production phase within crucial winter ranges should be limited to the daylight hours of one hour after sunrise to one hour before sunset from December 1 to June 20. Entries by service vehicles into Elk Fork drainage should be limited to one trip per day.

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APPENDIX

Interviews:

1. John Weaver (FS)
2. Jack Saunders (FS)
3. Bob Boyle (FS)
4. Frank Prossor
5. Ursula Kepler

BIOLOGICAL ASSESSMENT EXPERT'S INTERVIEW

T/E species biologist

NAME: – John Weaver DATE: 9/13/84

ADDRESS Bridger-Teton N.F.; Jackson, Wyoming PHONE: (307) 733-2752

SPECIES REFERRED TO: Gray Wolf, Grizzly Bear

Occurrence of the Species:

GW – No recent reports in this area – some in Sunlight "large canid"
GB – Occurs there

Anticipated Impacts of the Proposed Action:

GW)
)-insure sanitation
GB)
no firearms
helicopter corridors
access activities in adjacent drainages
intensive administration (compliance inspection)
If this is done, then the impacts should be minimal

Pertinent Literature and other Known Experts:

Dale Harms – U. S. FWS in Helena – has literature and guidelines and standards.

Work that's been done and Future Study Needs:

Cumulative effects models (displacement, habitat, mortality)

need more of this sub-model
(monitoring information needed)

Other:

BIOLOGICAL ASSESSMENT EXPERT'S INTERVIEW

(Forest Biologist)
Shoshone N.F.
USFS – Cody
S.O.

NAME: – Jack Saunders DATE: 9/7/84

ADDRESS 225 W. Yellowstone Ave. – Cody PHONE: (307) 527-6241

SPECIES REFERRED TO: Bald Eagle, Peregrine Falcon, Gray Wolf, Grizzly Bear

Occurrence of the Species:

BE – Oct.-Nov. through January 3-4 eagles/winter
PF – Non-existent – no potential in the N.F. in Forest Plan
GW – Not recovery area in plan. No verified sighting of wolves in study area.
GB – Do occur there

Anticipated Impacts of the Proposed Action:

BE – No effect on B. Eagles Helicopters could impact if operating there.
PF – None
GW – None
GB – Pers. Opin. – won't have an effect on

Pertinent Literature and other Known Experts:

Bob Boyle – Recr. Tech. for Wapiti Ranger Station
Brannon – Brannon Lodge
Gary Carver – Sec. staff
Ron Wilcox – Dist. Ranger IGBT

Work that's been done and Future Study Needs:

BE – none)
)-- just monitor
PF – none)

GW – none)-- report sightings

GB – distribution and behavior studies

Other:

Should do reclassification of the GB situation status

BIOLOGICAL ASSESSMENT EXPERT'S INTERVIEW

(Recreation Technician)
USFS
Shoshone N.F.
Wapiti Ranger Station

NAME: – Bob Boyle DATE: 9/7/84

ADDRESS Wapiti Ranger Station – North Fork PHONE: (307) 587-3925

SPECIES REFERRED TO: Bald Eagle, Peregrine Falcon, Gray Wolf, Grizzly Bear

Occurrence of the Species:

BE – Occur from October through May (maybe later) – most at any time = 2, seen frequently, no nests. (Golden eagle nest)
PF – None seen
GW – No verified sightings
GB – Occur through the area

Anticipated Impacts of the Proposed Action:

BE – No problem – not enough of them, usually right at the river

GB – No problem

Pertinent Literature and other Known Experts:

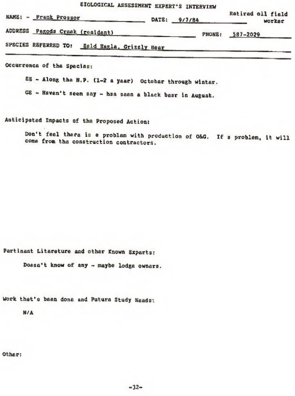
Frank Prossor – 587-2029 (Cody) lives on Pagoda Creek
Ursula Kepler – Cody – bird watcher

Work that's been done and Future Study Needs:

N/A

Other:

APPENDIX H



BIOLOGICAL ASSESSMENT EXPERT'S INTERVIEW

NAME: - Frank Prossor DATE: 9/7/84 Retired oil field worker

ADDRESS Pagoda Creek (resident) PHONE: 587-2029

SPECIES REFERRED TO: Bald Eagle, Grizzly Bear

Occurrence of the Species:

BE - Along the N.F. (1-2 a year) October through winter.

GB - Haven't seen any - has seen a black bear in August.

Anticipated Impacts of the Proposed Action:

Don't feel there is a problem with production of O&G. If a problem, it will come from the construction contractors.

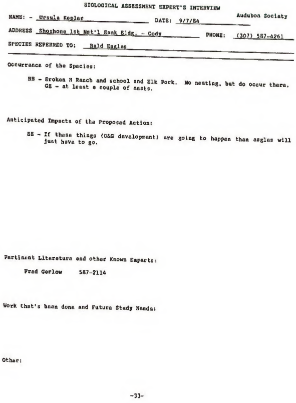
Pertinent Literature and other Known Experts:

Doesn't know of any - maybe lodge owners.

Work that's been done and Future Study Needs:

N/A

Other:



BIOLOGICAL ASSESSMENT EXPERT'S INTERVIEW

NAME: - Ursula Keplar DATE: 9/7/84 Audubon Society

ADDRESS Shoshone 1st Nat'l Bank Bldg. - Cody PHONE: (307) 587-4261

SPECIES REFERRED TO: Bald Eagles

Occurrence of the Species:

BE - Broken H Ranch and school and Elk Fork. No nesting, but do occur there.
GE - at least a couple of nests.

Anticipated Impacts of the Proposed Action:

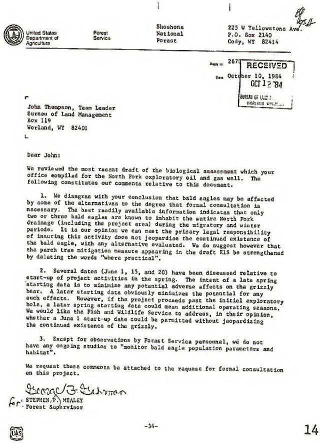
BE - If these things (O&G development) are going to happen then eagles will just have to go.

Pertinent Literature and other Known Experts:

Fred Gerlow 587-2114

Work that's been done and Future Study Needs:

Other:



United States Department of Agriculture
Forest Service
Shoshone National Forest
225 W Yellowstone Ave.
P.O. Box 2140
Cody, WY 82414

Reply to: 2670

Date: October 10, 1984

RECEIVED
OCT 12 '84
BUREAU OF [illegible]
WORLAND [illegible]

John Thompson, Team Leader
Bureau of Land Management
Box 119
Worland, WY 82401

Dear John:

We reviewed the most recent draft of the biological assessment which your office compiled for the North Fork exploratory oil and gas well. The following constitutes our comments relative to this document.

1. We disagree with your conclusion that bald eagles may be affected by some of the alternatives to the degree that formal consultation is necessary. The best readily available information indicates that only two or three bald eagles are known to inhabit the entire North Fork drainage (including the project area) during the migratory and winter periods. It is our opinion we can meet the primary legal responsibility of insuring this activity does not jeopardise the continued existance of the bald eagle, with any alternative evaluated. We do suggest however that the perch tree mitigation measure appearing in the draft EIS be strengthened by deleting the words "where practical".

2. Several dates (June 1, 15, and 20) have been discussed relative to start-up of project activities in the spring. The intent of a late spring starting date is to minimize any potential adverse affects on the grizzly bear. A later starting date obviously minimizes the potential for any such effects. However, if the project proceeds past the initial exploratory hole, a later spring starting date could mean additional operating seasons. We would like the Fish and Wildlife Service to address, in their opinion, whether a June 1 start-up date could be permitted without jeopardizing the continued existence of the grizzly.

3. Except for observations by Forest Service personnel, we do not have any ongoing studies to "monitor bald eagle population parameters and habitat".

We request these comments be attached to the request for formal consultation on this project.

George F. Gehrman
for: STEPHEN P. MEALEY
Forest Supervisor

APPENDIX H

RECEIVED
FEB 01 '85
BUREAU OF LAND MANAGEMENT
WORLAND WYOMING

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Endangered Species, Field Office
Federal Bldg., U.S. Courthouse
301 South Park
P.O. Box 10023
Helena, Montana 59626

IN REPLY REFER TO:
6.1.84.F.011
W.02 North Fork Well

January 28, 1985

TO: State Director, BLM, Cheynne, WY

FROM: Field Supervisor, Endangered Species, FWS, Helena, MT

SUBJECT: Section 7 Consultation -- North Fork Exploratory Oil/Gas Well

This is the Fish and Wildlife Service's (FWS) biological opinion prepared in response to your request for formal consultation on the effects the proposed North Fork Shoshone River APD (Federal 34-13) by Marathon Oil Company will have on the threatened grizzly bear (Ursus arctos horribilis) and the endangered bald eagle (Haliaeetus leucocephalus). Consultation was first initiated on March 28, 1984, however, by letter of June 5, 1984 you requested that the consultation be held in abeyance so that alternatives to the proposed action could be reassesed and the draft environmental impact statement (DEIS) revised. We received the revised DEIS and your request for reinitiation of formal consultation on November 1, 1984.

The FWS has examined the proposed project in accordance with the Section 7 Interagency Cooperation Regulations (50 CFR 402, 43 FR 870) and the Endangered Species Act, as amended. This biological opinion refers only to the potential effects on the grizzly bear and bald eagle and not the overall environmental acceptability of the proposed action.

PROJECT DESCRIPTION

Marathon proposes to drill a 5,000 foot wildcat exploratory oil/gas well near Pagoda Creek in Park County, Wyoming (T52N,R106W,S34). The prefered alternative identified by BLM requires airlift mobilization for the exploratory drilling. The proposed helicopter staging area would be placed off Highway 16 approximately 1 mile up Clocktower Creek in an area previously used as a gravel pit. The helicopters would haul an estimated 910 loads and have an estimated flying time of 162 hours.

Lease stipulation C(part 3) which prohibits any surface use between June 15 and September 7 would be waived. All drilling and associated activity will begin after June 20 and be completed before September 1. Activity including construction, drilling, and well completion is expected to take 2 to 4 months. Approval of this APD by BLM would not include approval of production facilities. A separate application for production facilities would be required if the well is a producer.

BIOLOGICAL OPINION

It is the FWS biological opinion that the exploratory phase of the proposed North Fork Well APD is not likely to jeopardize the continued existence of the grizzly bear and bald eagle. Our opinion however, is contingent upon mitigation measures 2,3,4, and 5 recommended on pages 50 and 51 of the Revised DEIS be incorporated into the project design and implementation.

BASIS OF OPINION

Grizzly Bears:

Grizzly bear sightings and sign observations from 1979-84 indicate substantial bear use in the analysis area. A histogram showing seasonal distribution of these observations indicates that most of the use occurs in May and June. A large ungulate population wintering in this area provides spring carrion. Research by the Interagency Grizzly Bear Study Team (IGBST) has shown that concentrations of protein-rich foods, such as ungulates or spawning trout, adds considerable value to the habitat. Food habits analysis (IGBST) indicate that elk is a significant food item in the spring. Seasonal bear scat analysis from 1979-81 indicated that the most important food category in spring was grasses/sedges (48.2% Freq.; 27.0% Vol.) and mammals (primarily elk) was the second most important food (46.5% Freq.; 34.6% Vol.).

Thus, the long term maintenance of this wintering ungulate population plus the availability of spring habitat components appears important to the survival of grizzlies using the area. At least 15 grizzly bear sightings and sign observations were documented in the Lower Elk Fork drainage between 1981 and 1984. Six of these observations were of female bears with cubs. At least 4 radio-collared grizzly bears have been observed in the study area one or more times between 1981 and 1983.

The DEIS indicates that significant numbers of elk can be found on their winter range from December 15 to mid-June. The average return date of elk to their winter range in the North Fork is December 1. Therefore, with a seasonal restriction on oil/gas activities from December 1 to June 20, displacement of elk from the winter range and displacement of grizzlies from spring range should be minimal. The histogram of grizzly use indicates that the area receives significant use during both the months of May and June. A June 1 startup date for project activities would make the winter-killed elk unavailable to bears during much of the critical spring period. Therefore, a project startup date prior to June 20 is unacceptable.

Activities associated with Federal 34-13 are not expected to affect denning of grizzly bears. There are no documented grizzly bear dens in the study area and based on den site characteristics determined by the IGBST, potential denning habitat does not occur within the influence zone of the project. Should field development occur and the influence zone expand, the potential however, to effect denning activities increases.

In summary, impacts associated with the exploratory phase of the proposed project should not impact the numbers, reproduction, and distribution of the grizzly to a degree that would jeopardize the species because:

1) A December 1 to June 20 seasonal restriction greatly minimizes displacement of elk from the winter range and displacement of grizzlies from spring range.

2) The habitat value and grizzly use of the project area at other times of the year appears low.

3) Adverse habitat modification or distruction of important grizzly habitat components would be insignificant.

4) Denning activity is not expected to be effected.

5) The potential for grizzly/human conflicts resulting in a bear getting killed or relocated is greatly minimized by incorporating and enforcing mitigation numbers 3, 4, and 5 on pages 50 and 51 of the DEIS.

BALD EAGLE:

The North Fork drainage from Elk Fork downstream is open (ice free) at least part of the winter each year, and as such, could be used by eagles for feeding on fish and/or waterfowl. The area is also winter range for big game and bald eagles likely feed on winter killed big game carcasses.

Your biological assessment indicates that a few bald eagles (probably no more than 5) are seen each year in the North Fork drainage from October through April. Most eagles appear to be migrating through the area, particularly in the spring but there have been some observations of eagles wintering in the drainage. There are no known nest sites in the analysis area.

Impacts associated with the project should not impact the numbers, reproduction, and distribution of the bald eagle to a degree that would jeopardize the species because:

1) There are no known nest sites in the North Fork;

2) the North Fork Shoshone River appears not to be a major wintering concentration area;

3) a seasonal restriction on project activities from December 1 to June 20 to protect the grizzly reduces the potential overlap of project activities with potential eagle use of the area to the months of October and November;

4) impacts from displcement, should it occur during October and November would be relatively insignificant since the entire North Fork is ice free during these months.

ADVISORY STATEMENT

The BLM action being considered in this consultation is the issuance of the North Fork Well APD. Under Section 7 consultation, the scope of this action includes not only the issuance of this APD, but all resulting subsequent activities. In North Slope Borough v. Andrus, 486 F. 332 (D.D.C. 1980), reversed on other grounds, 642 F. 2d 589 (D.C.CIR. 1980), the court concluded that consultation responsibilities under Section 7 for a multi-stage oil/gas project are not complete until a comprehensive biological opinion covering the entire action (i.e. through field development) is issued. However, the court held that the Endangred Species Act does not require the government

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to hold the initial phase of the multi-stage project in abeyance merely because an agency does not currently have the information to insure that the latter stages will not jeopardize listed species. The court stated that the lack of a comprehensive biological opinion does not preclude initiation of intermediate stages in a project *if*: 1) there is a reasonable likelihood that the entire project will comply with Section 7 (a)(2) and there is no evidence of noncompliance; 2) the Service finds in a biological opinion on each intermediate stage that that stage will not violate Section 7 (a)(2); 3) research is continued such that a comprehesive biological opinion on the entire project can be issued before the project is completed; 4) there is not an irreversible or irretrievable commitment of resources which may have the effect of foreclosing the formulation or implementation of any reasonable and prudent measures that would avoid violating Section 7 (a)(2).

In order to make a determination as to whether there is a reasonable likelihood that the entire action can be taken and not jeopardize the grizzly bear, we had to evaluate information presented in the original DEIS. In that document impacts associated various levels of field development were evaluated and displayed. Table 1 of that document indicates that drilling/development/production of Federal 34-13 without road access will not impact wetlands, floodplains, or elk crucial preferred winter range. Thus, destruction or adverse modification of important grizzly bear habitat components would be largely insignificant. The data indicate however, that impacts to these components increase significantly as field development progresses. In addition to these habitat modifications, operation and maintenance of producing wells using motorized equipment during the winter and spring period would displace both elk and grizzlies. Displacement of these species during the critical time periods over the entire life of field production could certainly jeopardize the grizzly.

Therefore, it appears that in order for the entire action to be completed (exploration through production) without jeopardizing the grizzly, the development and production phases will have to be designed to:

1) hold the destruction or adverse modification of important habitat components to an acceptable level;

2) avoid displacing elk from winter ranges and grizzlies from spring ranges.

This may be accomplished in part by:

1) placing production facilities (including battery and control facilities) near Highway 16;

2) remote well head monitoring using telemetry techniques that would virtually eliminate the need to access the well sites during the production phase except for emergencies;

3) seasonal restrictions during the critical winter and spring periods for activities associated with exploratory drilling and installation of production facilities. Maintenance of producing wells requiring workover rigs, large trucks, etc. could be scheduled to avoid the critical winter and spring periods;

4) using the Cumulative Effects Analysis (CEA) model now being developed for the Yellowstone Ecosystem to establish an acceptable level of activity and habitat modification.

Formal consultation on the American Petrofina Plan of Operations for the Hall Creek APD on the Lewis and Clark National Forest, Glacier County, Montana indicated that it is technically feasable to operate and monitor production facilities off-site. The technology employed in the Petrofina Plan of Operations virtually eliminates the need for daily visits to the well site, and as such, provides an opportunity to schedule and coordinate activities associated with production with the biological requirements of the grizzly. Similar technology and techniques may have to be employed for the North Fork well should it be a producible one.

Based on the above considerations, the FWS concludes that the technology and techniques are available that, if employed, provides a reasonable likelihood that the entire action can be taken and comply with Section 7 (a)(2) of ESA.

In North Slope Borough v. Andrus, 642 F. 2d 589 (D.C.C. 1980), the Court concluded that consultation responsibilities under Section 7 for a multi-stage oil/gas project are not complete until a comprehensive biological opinion covering the entire action is issued. However, there is not sufficient data upon which to base a biological opinion on development and production of the North Fork well and on various levels of field development.

Should the well be producible, the applicant in conjunction with the BLM and Forest Service should devise a management plan for the production, operation, and maintenance of the well that would have the least impact on the grizzly. Formal consultation should be reinitiated by the BLM and Forest Service on this plan and on an area development plan for the analysis area.

We believe that the information needed to design the development and production phases, to assure that the grizzly will not be jeopardized, can best be accomplished through an area development plan. The constraints necessary to protect all surface resources, including wildlife and endangered and threatened species, would define the parameters within which field development could occur. To identify the restrictions necessary to assure that the grizzly would not be jeopardized, we recommend that the CEA model now being developed for the Yellowstone Ecosystem be applied.

The CEA model is designed to (1) quantify individual and collective effects of land uses and activities in space and through time, and (2) provide managers an analytic tool for evaluating alternative decisions relative to grizzly bear recovery goals and objectives. The CEA is composed of three submodels: (1) habitat, (2) displacement, and (3) mortality. The habitat and displacement submodels determine the effective habitat value of an area while the mortality submodel determines the mortality risks.

The habitat submodel incorporates four variables: (1) food and thermal cover, (2) habitat diversity, (3) seasonal equity, and (4) denning suitability. These basic variables combined indicate the year-round habitat quality of an area. The displacement submodel includes four variables of human activity: (1) location relative to security cover, (2) type (motorized or non-motorized) (3) nature (linear, point, or dispersed), and (4) intensity (high or low use, day or overnight use). Displacement is characterized by a coefficient of habitat effectiveness and by an associated zone of influence.

The mortality submodel incorporates four basic variables regarding human activity: (1) location relative to habitat quality, (2) nature (linear, point, or dispersed), (3) intensity and sanitation, and (4) firearms. The relative risk of mortality can be compared between activities. By integrating the submodels, the cumulative effects model provides two basic outputs: (1) value of the effective habitat, and (2) relative risk of mortality.

At the present time, we cannot quantify the habitat quality and effectiveness of the project area and the subsequent changes in habitat quality/effectiveness as a result of different levels of field development. Application of the CEA Model would allow this to be done so that an acceptable area development plan could be developed.

Your biological assessment and information provided by the Wyoming Game and Fish Department for this consultation indicates that the management stratification (Management Situation 5) for the analysis area is not consistent with the level of grizzly use in the area and its apparent importance to the survival and recovery of the species. The stratification of this general area should be reevaluated and changed to the appropriate management situation.

In summary, we recommend that:

1) the project operating period must be restricted to the period of June 21 to November 30. A project start-up date prior to June 20 would make winter-killed elk unavailable to bears during much of the critical spring period. Even though it is our biologicl opinion that a project start-up date of June 21 is not likely to jeopardize the grizzly, available information indicates that due to variables in environmental conditions, grizzlies may use the project area after this date. A July start-up date would be less likely to result in an overlap of project activities with grizzly use of the area;

2) the forested and nonforested habitat components in the Shoshone Bear Management Unit be mapped;

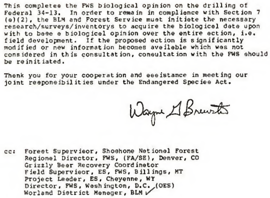
3) the Yellowstone Ecosystem Cumulative Effects Analysis Model be applied to evaluate various levels of field development;

4) a management plan for production of Federal 34-13 and an area development plan be developed that establishes the parameters within which field development could occur without jeopardizing the grizzly;

5) the Forest Service and BLM reinitiate formal consultation on the production plan for Federal 34-13 and the area development plan so that a biological opinion can be provided over the entire action;

6) stratification in this area be reevaluated and changed to the appropriate management situation based on bear use and habitat quality.

APPENDIX H

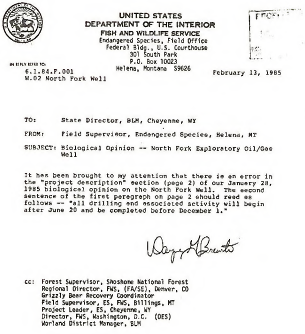


This completes the FWS biological opinion on the drilling of Federal 34-13. In order to remain in compliance with Section 7 (a)(2), the BLM and Forest Service must initiate the necessary research/surveys/inventorys to acquire the biological data upon with to base a biological opinion over the entire action, i.e. field development. If the proposed action is significantly modified or new information becomes available which was not considered in this consultation, consultation with the FWS should be reinitiated.

Thank you for your cooperation and assistance in meeting our joint responsibilities under the Endangered Species Act.

Wayne G Brewster

cc: Forest Supervisor, Shoshone National Forest
Regional Director, FWS, (FA/SE), Denver, CO
Grizzly Bear Recovery Coordinator
Field Supervisor, ES, FWS, Billings, MT
Project Leader, ES, Cheyenne, WY
Director, FWS, Washington, D.C. (OES)
Worland District Manager, BLM ✓



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Endangered Species, Field Office
Federal Bldg., U.S. Courthouse
301 South Park
P.O. Box 10023
Helena, Montana 59626

IN REPLY REFER TO:
6.1.84.F.001
W.02 North Fork Well

February 13, 1985

TO: State Director, BLM, Cheyenne, WY

FROM: Field Supervisor, Endangered Species, Helena, MT

SUBJECT: Biological Opinion -- North Fork Exploratory Oil/Gas Well

It has been brought to my attention that there is an error in the "project description" section (page 2) of our January 28, 1985 biological opinion on the North Fork Well. The second sentence of the first paragraph on page 2 should read as follows -- "all drilling and associated activity will begin after June 20 and be completed before December 1."

Wayne G Brewster

cc: Forest Supervisor, Shoshone National Forest
Regional Director, FWS, (FA/SE), Denver, CO
Grizzly Bear Recovery Coordinator
Field Supervisor, ES, FWS, Billings, MT
Project Leader, ES, Cheyenne, WY
Director, FWS, Washington, D.C. (OES)
Worland District Manager, BLM

APPENDIX I

GRIZZLY BEAR MANAGEMENT GUIDELINES

I. INTRODUCTION

The Endangered Species Act (ESA) (P.L. 93-205) requires special protection and management on Federal lands for the grizzly bear (Ursus arctos horribilis), a threatened* species*. Forest Service and Park Service personnel cooperatively developed guidelines for grizzly protection and management in the National Forests and National Parks of the Greater Yellowstone Area (Figure 1, page 52) in compliance with ESA (FSM 2601.1).

II. BACKGROUND

Grizzly bear populations and distribution have been greatly reduced in the Western United States since the early 1900's because of loss of habitat and conflicts with man. One of the last remaining grizzly populations occurs in the Greater Yellowstone Area. Here, the welfare of the grizzly bear has greatly concerned scientists and laymen, especially during the last decade. The effects of open-pit garbage dump closures, hunting, domestic livestock grazing, roads and road construction, recreation activities, and logging on grizzly bears and their habitat have been concerns. The Interagency Grizzly Bear Study Team, with members from the National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, and the States of Idaho, Montana, and Wyoming, was appointed in 1973, to provide research information about the grizzly population and its habitat in the Yellowstone Area. In July 1974, an ad hoc committee of the National Academy of Sciences concluded that the Yellowstone grizzly was not in immediate danger of extinction, but that conservative management of the species was necessary.

On August 1, 1975, the grizzly bear south of Canada was determined to be a threatened species by the Secretary of Interior under ESA authority. This determination required Federal agencies to:

1. utilize their authorities to carry out conservation programs for listed species;
2. insure that their activities not jeopardize the continued existence of a listed species; and,
3. insure that their activities or programs not result in the destruction or adverse modification of critical habitat.

III. POLICY

A. Park Service Grizzly Bear Policy

Management policies of the National Parks are designed to:

1. perpetuate wild, free-ranging grizzly bear populations; and,
2. minimize conflicts between humans and grizzly bears by reducing man-generated food sources and by regulating visitor distribution.

Specifically, the Park Service will identify, within Park boundaries, grizzly habitat requirements. As necessary, the Service shall control visitor use and access to such habitat, including closure to entry for other than official purposes. Active management programs, where necessary, will be carried out to perpetuate the natural distribution and abundance of grizzlies and the ecosystems on which they depend, in accordance with existing Federal laws. The Service will cooperate with the Fish and Wildlife Service, which is recognized as the lead agency in matters pertaining to threatened or endangered species.

Management actions for the protection and perpetuation of grizzly bears shall be incorporated into the resources management plan. The Yellowstone and Grand Teton National Park Grizzly Bear Management Programs are included in the Appendix, page 66. The Programs will complement and supplement these Guidelines.

B. National Forest System Grizzly Bear Policy

National Forests in the Greater Yellowstone Area will conserve* the grizzly as a species (ESA) and provide habitat suitable for the perpetuation of the species (FSM 2603).

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*See glossary Page 65

APPENDIX I

Grizzly bear habitat will be maintained and enhanced, and grizzly-human conflict* potential will be minimized. State wildlife management agencies and the U.S. Fish and Wildlife Service will, after consulting with the National Forests, perform grizzly control actions including live-trapping, relocation and removal. Specific policy is stated for the following resource management systems.

1. Wildlife Management

   As a threatened species, grizzly bears will receive, along with other listed species, the highest priority in maintaining and developing suitable habitat through:

   a. coordination of grizzly population and habitat needs with the management of other National Forest resources; and

   b. specific habitat improvement projects (FSM 2630.2). Habitat improvements which have an adverse impact on grizzlies will be deferred (FSM 2630.3).

The possible effects of existing or proposed land uses upon grizzlies and/or their habitat will be determined through a competent review or biological assessment (FSM 2670). The "Method for Determining Grizzly Bear Habitat Quality and Estimating Consequences of Impacts on Grizzly Habitat Quality" (Appendix, page 79) is recommended for review or assessment of major projects or activities.

2. Timber and Fire Management

   The protection needs for grizzlies and/or their habitat will be considered in all timber and fire management programs (FSM 2606.23). Proposed logging activities and associated road construction will be evaluated to assure protection of grizzlies and/or their habitat.

3. Range Management

   Domestic livestock grazing in grizzly use areas is an acceptable practice if done under approved allotment management plans reflecting sensitivity for the ecological needs of the grizzly. Important habitat for grizzlies will be protected in all range management and improvement programs (FSM 2602.11).

4. Recreation Management

   The protection needs for grizzlies and/or their habitat will be considered in providing for recreation use. Development of any recreation facilities or activities detrimental to grizzlies or to their important habitat will be deferred (FSM 2606.12).

5. Minerals, Watershed, and Special Uses Management

   The protection needs of grizzlies and/or their habitat will be considered in all watershed management programs (FSM 2606.14), and in all mining and special use administration activities which have the potential to affect grizzlies and/or their habitat. Grizzly habitat and grizzly-human conflict potential will be evaluated fully in administering and evaluating applications or proposals for:

   a. mining activities involving minerals, gas and oil, and geothermal exploration and production;

   b. water developments;

   c. resorts and summer homes under special use permits;

   d. all other special use and nonspecial use activities (FSM 2700) which affect or have the potential to affect grizzlies and/or their habitat.

6. The protection needs of grizzlies and/or their habitat will be considered in engineering, forest insect and disease control, and landownership adjustment activities (FSM 2606.32, 2606.24, and 2606.31).

7. An environmental analysis shall be made for all policies, plans, programs and projects affecting resources, or other land uses, or the quality of the physical, biological, economic, and social environment (FSM 1940.3). Management Direction and Management Guidelines contained in "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" will be used as an information source and guidance in conducting environmental analyses to support Land and Resource Management Plans and specific projects.

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*See glossary - Page 65

APPENDIX I

IV. GRIZZLY BEAR MANAGEMENT SITUATIONS*

Five different grizzly management situations are described for the Greater Yellowstone Area. All National Forest and National Park lands will be identified by appropriate situations (Figure 2, page 53). Each management situation fits a type of land area where unique:

1. grizzly populations and habitat conditions exist; and,
2. management direction applies.

Forest Supervisors and Park Superintendents will identify the different management situation areas in their respective areas of responsibility.

A. Management Situation 1

1. Population and habitat conditions The area contains grizzly population centers (areas key to the survival of grizzlies where seasonal or year-long grizzly activity, under natural, free-ranging conditions is common*) and habitat components needed for the survival and recovery of the species or a segment of its population. The probability is very great that major Federal activities or programs may affect (have direct or indirect relationships to the conservation and recovery of) the grizzly.

2. Management direction Grizzly habitat maintenance and improvement (improvement applies to Forest Service only), and grizzly-human conflict minimization will receive the highest management priority (FSM 2603). Management decisions will favor the needs of the grizzly bear when grizzly habitat and other land use values compete. Land uses which can affect grizzlies and/or their habitat will be made compatible with grizzly needs or such uses will be disallowed or eliminated. Grizzly-human conflicts will be resolved in favor of grizzlies unless the bear involved is determined to be a nuisance.* Nuisance bears may be controlled through either relocation or removal but only if such control would result in a more natural free-ranging grizzly population and all reasonable measures have been taken to protect the bear and/or its habitat (including area closures and/or activity curtailments).

B. Management Situation 2

1. Population and habitat conditions. The area lacks distinct grizzly population centers; highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present occasionally. By definition, Management Situation 2 areas are those considered unnecessary for survival and recovery of the species, although the status of such areas is subject to review and change according to demonstrated grizzly population and habitat needs. Major activities or programs may affect the conservation and recovery of grizzly bears primarily in that they may contribute to ward human-caused bear mortalities.

2. Management direction. The grizzly bear is an important, but not the primary, use on the area. Habitat maintenance and improvement may be, in some cases, an important management consideration. Management will at least maintain those habitat conditions which resulted in the area being stratified as Management Situation 2. Minimization of grizzly-human conflict potential that could lead to human-caused mortalities is a high management priority.

Demonstrated grizzly populations and/or grizzly habitat use will be accommodated in other land use activities if feasible, but not to the extent of exclusion of other use needs. A feasible accommodation is one which is compatible with (does not make unobtainable) the major goals and/or objectives of other uses. When grizzly population and/or grizzly habitat use and other land use needs are mutually exclusive, the other land use needs may prevail in management considerations. If grizzly population and/or habitat use represents demonstrated needs that are so great (necessary to the normal needs or survival of the species or a segment of its population) that they should always prevail in management considerations, then the area should be reclassified under Management Situation 1. Nuisance grizzlies will be controlled.

C. Management Situation 3

1. Population and habitat conditions Grizzly presence is possible but infrequent. Developments, such as campgrounds, resorts or other high human use associated facilities, and human presence result in conditions which make grizzly presence untenable for humans and/or grizzlies. There is a high probability that major Federal activities or programs may affect the species' conservation and recovery.

2. Management direction Grizzly habitat maintenance and improvement are not management considerations. Grizzly-human conflict minimization is a high priority management consideration. Grizzly bear presence and factors contributing to their presence will be actively discouraged. Any grizzly involved in a grizzly-human conflict will be controlled. Any grizzly frequenting an area will be controlled.

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*See glossary - Page 65

D. Management Situation 4

1. Population and habitat conditiona Grizzlies do not occur in the area but habitat and human conditions make the area potentially suitable for grizzly occupancy, and the area is needed for the survival and recovery of the species. The probability is very great that major Federal activities and programs may affect the species' conservation and recovery.

2. Management direction The grizzly bear is an important potential use on the area. Grizzly habitat maintenance and improvement are important management considerations. Grizzly-human conflict minimization is not a management consideration. Habitat and human conditions making the area suitable for grizzly occupancy will not be degraded pending decisions regarding reestablishment of grizzlies.

E. Management Situation 5

1. Population and habitat conditions Grizzlies do not occur, or occur only rarely in the area. Habitat may be unsuitable, unavailable, or suitable and available but unoccupied. The area lacks survival and recovery values for the species or aaid values are unknown. Major Federal activities and programs probably will not affect species conservation and recovery.

2. Management direction Consideration for grizzly bears and their habitat in other resource related decisions is not directed. Maintenance of grizzly habitat is an option. Any grizzly involved in a grizzly-human conflict will be controlled.

V. GRIZZLY BEAR MANAGEMENT GUIDELINES

Grizzly management guidelinea for each of five resource management syatems are listed for each management situation. The guidelines are grouped under the headings:

1. Maintain and Improve (NF) Habitat;

2. Minimize Grizzly-Human Conflict Potential; and,

3. Resolve Grizzly-Human Conflicts.

The heading subjects are the major grizzly management objectives.

GUIDELINES ARE SUBJECT TO CHANGE AS RESEARCH PROVIDES ADDITIONAL DATA AND/OR MANAGEMENT DIRECTIVES CHANGE.

APPENDIX I

GRIZZLY BEAR MANAGEMENT GUIDELINES

MANAGEMENT SITUATION: I

MGMT. SYSTEM OR ACTIVITY	MAINTAIN AND IMPROVE HABITAT	MINIMIZE GRIZZLY-HUMAN CONFLICT POTENTIAL	RESOLVE GRIZZLY-HUMAN CONFLICTS
Wildlife Management	1. Maintain close contact with research organizations to assure that current research data are being used in resource planning and administration affecting grizzlies. NF, NP.	→ 1.	Line officers will be provided with instructions for: (1) Fact finding, including (a) determination of where, why, when, and how the conflict occurred (b) who was involved; (c) determination of status of problem bear (nuisance or nonnuisance) considering unnatural food dependency and individual bear history; see Appendix, page 57; (2) grizzly control, including names and phone numbers of personnel from state wildlife management agencies and the U.S. Fish and Wildlife Service, page 57; (3) live trapping; (4) tranquilization; (5) removal, including carcass disposal; (6) relocation, including maps of specific recommended relocation sites. Relocation plans with implications for both National Parks and National Forests will be reviewed and agreed upon by Park Service, Forest Service, and state wildlife personnel. NF, NP.
	2. Complete a biological assessment (may use U.S. Forest Service (1977) procedures) of existing or proposed land uses (under the Recreation, Range, Timber and Fire and Minerals, Watershed and Special Use Management Systems) which could affect grizzlies and/or their habitat. NF, NP.	→ 2.	
	3. Initiate consultation procedures with the U.S. Fish and Wildlife Service, as necessary, if the biological assessment results in a "may effect" determination. BLM should initiate consultation related to mineral leasing. NF, NP.	→ 3.	
	4. If grizzly population and habitat use is demonstrated, and with full awareness of the Biological Opinion, recommend project or land use modifications which will provide compatibility between grizzly bears and other land uses without degrading conditions for grizzlies. If projects or land uses cannot be made compatible and grizzly needs are great (as in Management Situation 1) then recommend area be reclassified under Management Situation 1. If grizzly use does not constitute need for species survival and recovery then recommend proceeding with the activity. NF, NP.	→ 4.	
	3. In necessary cases, specify, with full awareness of the Biological Opinion measures to be taken within the different resource management systems which will protect and maintain grizzly bears and their habitat. NF, NP.	→ 3	
	6. If applicable, specify feasible measures to be taken independent of other resource management systems, to improve grizzly bear management. For example, inform the public of National Forest and National Park grizzly bear management goals and objectives. Enlist their support in meeting these goals and objectives. NF, NP.	→ 6.	
	7. Monitor the application of these guidelines to assure they are properly and effectively used. Recommend improvement in guidelines and application procedures. NF, NP.	7. Identify grizzly-human conflict potential within the different resource management systems and recommend measures to minimize conflict potential. NF, NP.	

GRIZZLY BEAR MANAGEMENT GUIDELINES

MANAGEMENT SITUATION: 2

MGMT.SYSTEM OR ACTIVITY	MAINTAIN AND IMPROVE HABITAT	MINIMIZE GRIZZLY-HUMAN CONFLICT POTENTIAL	RESOLVE GRIZZLY-HUMAN CONFLICTS
Minerals, Watershed, and Special Use Management	1. Proposed activities referenced in applications or proposals for (a) mineral, gas and oil, and geothermal exploration and development, (b) water developments, (c) new resorts and/or resort expansion, (d) all other special uses (FSM 2700), and (e) all uses which require no special use permits (FSM 2708) which are likely to affect grizzlies and/or their habitat will be evaluated. U.S.Forest Service (1977) procedures may be used. NF, NP.	→ 1.	In cases of grizzly human conflict, District Rangers in cooperation with state wildlife management agencies, will immediately identify the cause by determining where, why, when, and how the conflict occurred. If the problem bear is not determined to be a nuisance then correct the problem immediately by removing, if feasible, the man-related cause. Likely, man-related causes are grizzly attractants and/or human activities interfering with grizzly use of habitat. Attractants include food and food odors associated with man, livestock carrion, garbage, garbage dumps, prepared livestock and pet foods, camps or other dwellings, game meat in possession of man, and transportation and/or work livestock. Interference activities are those associated with mining, watershed development and special uses which disrupt grizzlies, grizzly habitat and/or grizzly use of habitat. Cause removal could involve simple activity modification or temporary activity cessation. If the area does not warrant reclassification under Management Situation 1 and temporary activity cessation or activity modification is not possible or feasible or does not solve the problem or if the problem bear is determined to be a nuisance, the U.S. Fish and Wildlife Service and state wildlife agencies will be requested to exercise control. See Appendix, page 57 for guidelines for determining grizzly nuisance status and for controlling nuisance grizzlies. NF.
	2. Where grizzlies are a factor, all operating plans and special use permits will specify feasible measures to meet National Forest and National Park grizzly management goals and objectives. Permits will include a clause providing for temporary cessation of activities if needed to resolve a grizzly-human conflict situation. Permittees', operators', and lessees' full cooperation in meeting grizzly management goals and objectives will be a condition to their receiving and holding approved permits and plans. NF, NP.	→ 2.	
	3. Activities which adversely affect grizzly bear populations and/or their habitat will, if feasible, be avoided. Adverse habitat effects could result from: (a) land surface disturbances, (b) water table alterations, (c) reservoirs, rights-of-way, roads, pipelines, canals, transmission lines, or other structures, (d) increased human presence, (e) reduced availability of natural foods. Important habits will be identified through the evaluation process (USFS, 1977). NF, NP.	→ 3.	
	4. Operating plans and special use permits will include specific feasible measures to protect and maintain grizzly habitat. Measures will address items a-e under 3 above, and others as necessary. NF, NP.	4. If grizzlies are a factor, operation plans and special use permits will specify food storage and handling and garbage disposal standards. The general rule will be that all attractants, as defined under conflict resolution, will be made unavailable to grizzlies. NF, NP.	

GRIZZLY BEAR MANAGEMENT GUIDELINES

MANAGEMENT SITUATION: 5

MGMT. SYSTEM OR ACTIVITY	MAINTAIN AND IMPROVE HABITAT	MINIMIZE GRIZZLY-HUMAN CONFLICT POTENTIAL	RESOLVE GRIZZLY-HUMAN CONFLICTS
All Management Systems and Activities	Grizzly habitat needs are not a necessary consideration. Maintenance of suitable and available but unoccupied habitat is an option. If taken, direction under MAINTAIN AND IMPROVE HABITAT, SITUATION 4, for all management systems and activites would apply. NF, NP.	Minimizing grizzly-human conflict is not a consideration. NF, NP. In the rare event that grizzlies occur in the area, no action is necessary unless conflict is imminent. If conflict is imminent, proceed as indicated under conflict resolution.	If grizzly-human conflict occurs, District Rangers in cooperation with state wildlife management agencies will immediately identify the cause by determining where, why, when, and how the conflict occurred. Correct the problem immediately by removing the man-related cause and controlling the problem bear. Likely man-related causes are grizzly attractants. Attractants include food and food odors associated with man, livestock carrion, garbage, garbage dumps, prepared livestock and pet foods, unsanitary camps or other dwellings and game meat in possession of man. The U.S. Fish and Wildlife Service and state wildlife agencies will be requested to exercise control. See page 57. NF.

APPENDIX I

II. Guidelines for Determining Grizzly Bear Nuisance Status

These guidelines apply to the Management Situation Areas defined in Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area. (USFS, 1978). In Management Situation Areas 1 and 2, grizzlies must be determined to be a nuisance by specific criteria before they can be controlled. In Situation Areas 3 and 5, any grizzly involved in a grizzly-human conflict situation is considered a nuisance and will be controlled. Control must be compatible with Recovery Plan objectives for limiting man-caused grizzly mortality.

In Management Situation 1 areas, a grizzly bear will be determined to be a nuisance if either or both of the following conditions apply:

A. the bear uses unnatural food materials (human and livestock foods, garbage, livestock carrion and game meat in the possession of man) which have been reasonably secured from the bear, resulting in habituation of the bear and/or human injury or loss of human life;

B. the bear has a history of aggressive (not defensive) behavior toward man which constitutes a demonstrable immediate or potential threat to human safety.

The following are considerations in determining grizzly nuisance status under condition A.

1. Unnatural foods were reasonably secure from grizzlies. Reasonably secure means all steps were taken to comply with guideline objectives a) Maintain and Improve Habitat and b) Minimize Grizzly-Human Conflict Potential listed under Management Situation 1. The following are examples of reasonably secure conditions:

   a) edibles and/or garbage was not allowed to accumulate; sight and/or smell of edibles and/or garbage was not dominant (i.e., food was canned or in other sealed containers) and edibles and/or garbage was made unavailable (hung out of reach or secured in a solid-sided-bear-proof-structure). Livestock use did not occur in habitat components critically important to grizzlies in time or space;

   b) livestock and wildlife carcasses were destroyed or treated so that the material would not reasonably be expected to attract grizzlies;

   c) game meat was hung so that the lowest portion of the carcass was suspended ten vertical feet above the highest ground object, three horizontal feet from the nearest lateral object and 100 yards from any camp area;

   d) no baits were placed for purposes of sport hunting black bears;

   e) no artificial feeding of grizzlies occurred.

2. Any human injury or loss of human life occurred as a result of a nondefensive grizzly attack.

The following are considerations in determining grizzly nuisance status under condition B:

The bear has a history of aggression toward man. Sound evidence must be available to establish that the problem bear acted aggressively without provocation (not defensively), and that such behavior constituted a threat to human safety, and that injury or death were the direct result of a grizzly attack.

If information is insufficient to clearly establish facts 1. and 2., under condition A., the problem grizzly probably should not be determined a nuisance under that condition. If information is insufficient to clearly establish fact 1., under condition B, the problem grizzly probably should not be determined a nuisance under that condition.

In Management Situation 2 areas, a grizzly bear will be determined to be a nuisance if either or both of the following conditions apply:

A. the bear uses unnatural food materials (human and livestock foods, garbage, livestock, livestock carrion and game meat) which have been reasonably and feasibly secured from the bear, resulting in habituation of the bear and/or human injury or loss of human life or significant loss of property;

B. the bear has a history of aggressive (not defensive) behavior toward man which constitutes a demonstrable immediate or potential threat to human safety.

The following are considerations in determining grizzly nuisance status under condition A:

1. unnatural foods were reasonably secure from grizzlies. Reasonably secure means: all feasible steps were taken to comply with guideline objectives a) Maintain snd Improve Habitat and b) Minimize Grizzly-Human Conflict Potential listed under Management Situation 2;

2. any human injury or loss of human life occurred or property losses were significant as a result of a nondefensive grizzly attack. For livestock on permitted use, a significant loss is two percent of the permitted number. Other losses are significant if property damage is recurrent and exceed $500.00 per individual.

The following are considerations in determining grizzly nuisance status under condition B:

> The bear has a history of aggression toward man. Sound evidence must be available to establish that the problem bear has acted aggressively without provocation (not defensively), and that such behavior constituted a threat to human safety, and that injury or death were the direct result of a grizzly attack.

If information is insufficient to clearly establish facts 1. and 2. under condition A., the problem grizzly probably should not be determined a nuisance under that condition. If information is insufficient to clearly establish fact 1., under condition B. the problem grizzly probably should not be determined a nuisance under that conditon.

III. Guidelines for Controlling Nuisance Grizzly Bears

Grizzlies determined to be nuisances under the criteria of II above, and all grizzlies in Management Situation Areas 3 and 5 involved in a grizzly-human conflict situation will be controlled, as long as such control is compatible with Recovery Plan objectives for limiting man-caused grizzly mortality.

The criteria in Table 1 and in Figure 2 should be used to guide control actions.

APPENDIX I

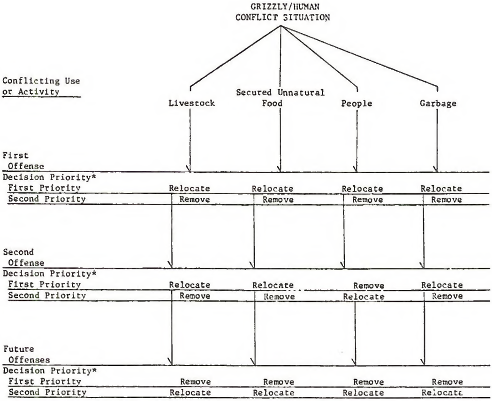
TABLE 1. GUIDELINES FOR GRIZZLY BEAR
CONTROL ACTION

TYPE OF GRIZZLY	NO OFFENSE	OFFENSES CONDITION A. 1st	CONDITION A. 2nd	CONDITION A. 3rd	CONDITION B. 1st	CONDITION B. 2nd	CONDITION B. 3rd
				TYPE OF PROBLEM			
Females							
Orphaned Cub***	REL						
Cub		REL*	REL	REM**	REL	REM	—
Yearling***		REL	REL	REM	REL	REM	—
Adolescent***		REL	REL	REM	REL	REM	—
Prime Adult		REL	REL	REM	REL	REM	—
Prime Adult with Young***		REL	REL	REM(adult)	REL	REM	(adult)
Old Adult***		REL	REM	—	REM	—	—
Old Adult with Young		REL	REL	(adult)	REL	REM	(adult)
Males							
Orphaned Cub	REL						
Cub		REL	REL	REM	REL	REM	—
Yearling		REL	REM	—	REL	REM	—
Adolescent		REL	REM	—	REL	REM	—
Prime Adult		REL	REM	—	REL	REM	—
Old Adult		REM	—	—	REM	—	—

*REL = RELOCATE, **REM - REMOVE
Problem grizzlies that are senile (weak in mind or body as a result of old age) or sick or injured beyond a point where natural recovery is likely, will be removed.

***Cub - young of the year.
***Yearling - 12 to 24 months old.
***Adolescent - 24-48 months old or breeding age or conditions.
***Young - cub, yearling or adolescent accompanying mother.
***Old - Indicates advanced age and deteriorated physical state, indicators are tooth wear and physical appearance.

APPENDIX I



*Decision Considerations
1. Sex, age, condition, reproductive status, and behavior of bear.
2. Type of conflict.
3. Number of offenses.

FIGURE 3. CRITERIA FOR GRIZZLY BEAR CONTROL ACTION

APPENDIX I

ACTION PROCEDURES IN CASES OF GRIZZLY-HUMAN CONFLICT

National Forest Land

1. All incidents of grizzly-human conflict will be investigated immediately and a factual and detailed report (answering who, what, when, why, where and how) submitted to the Forest Supervisor. In case of human death, notify the County Sheriff and County Coroner. In case of grizzly death, notify the U.S. Fish and Wildlife Service, the appropriate state wildlife management agency and the Interagency Grizzly Bear Study Team.

2. State wildlife management agencies and/or the U.S. Fish and Wildlife Service will handle problem grizzlies.

3. County sheriffs will have primary responsibility for backcountry rescue.

4. The site of an incident will be closed immediately to human use until the investigation is complete and the problem solved or corrected.

5. An interagency team with members from the county law enforcement agency, state wildlife management agency, U.S. Forest Service, U.S. Fish and Wildlife Service, and Interagency Grizzly Bear Study Team will investigate all incidents of grizzly inflicted human death.

6. News releases involving grizzly-human conflict incidents will be coordinated through all concerned agencies.

National Parks

1. All grizzly-human conflicts will be investigated and a factual and detailed bear incident report (YELL 371, Revised 3/13/69, GRTE SF-343) submitted to the Superintendent's Office. In incidents where injury and/or property damage have occurred, the investigating officer's report will be supplemented when possible by the statements of witnesses to the incident.

2. All management actions involving bears will be reported by telephone to the Resources Management Offices.

3. All grizzly bear sightings will be recorded in the station log and telephoned daily to the biologist's office, (YELL) and the Resource Management Specialist (GRTE). Information shall include observer, data, location, time, number, activity, and if possible, sex, age class, and individual description.

APPENDIX I

GLOSSARY

Areas Where Grizzly Activity Is Common: Areas where grizzly presence (evidenced by grizzly sightings, sign and kills) has been consistently documented over the years.

Conserve (conservation; definition from ESA, 1973): The term "conservation" means to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping and transplantation, and in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Grizzly-Human Conflict Situation: A confrontation between man and/or his property and bear(s) in which the safety of man and/or bear(s) is jeopardized and/or property loss occurs.

Habituated: A condition of grizzlies who consistently and aggressively pursue and depend upon food materials (human food, garbage, prepared livestock and pet foods, carrion, livestock, game meat) associated with man or his activities. Such individuals usually have no fear of man and are docile in man's presence until incited.

Management Situation: A condition or state of affairs with unique circumstances involving grizzly bears. Situations apply to and are represented as mapped land areas. A given situation will apply to land areas which may differ physically but share other characteristics (i.e., grizzly populations and habitat dependencies).

Natural, Free-Ranging Grizzly Bear Population: A nonhabituated grizzly population in which individuals use natural foods exclusively under free-roaming conditions. A more natural free-ranging grizzly population could result if:

(1) relocation would likely "wean" the problem grizzly from unnatural food use; or,
(2) removal of the problem grizzly, if totally habituated or dangerous to man, would likely rid the population of an unnatural (addicted) individual and perhaps open a space for a more natural individual.

Nuisance: In Management Situation 1 areas, a grizzly bear to whom either or both of the following conditions apply:

(1) the bear uses unnatural food materials (human and livestock foods, garbage, livestock, livestock carrion and game meat) which have been reasonably secured from the bear resulting in habituation of the bear and/or human injury or loss of human life;
(2) the bear has a history of aggressive (not defensive) behavior toward man which constitutes a demonstrable immediate or potential threat to human safety.

In Management Situation 2 areas, a grizzly bear to whom either or both of the following conditions apply;

(1) the bear uses unnatural food materials (human and livestock foods, garbage, livestock carrion and game meat) which have been reasonably secured from the bear resulting in habituation of the bear and/or human injury or loss of human life or significant loss of property;
(2) the bear has a history of aggressive (not defensive) behavior toward man which constitutes a demonstrable immediate or potential threat to human safety.

Species: (from ESA, 1973) The term "species" includes any subspecies of fish or wildlife or plants and any other group of fish or wildlife of the same species or smaller taxa in common spatial arrangement that interbreed when mature.

Threatened: (from ESA, 1973) The term "threatened species" means any species which is likely to become an endangered species within the forseeable future throughout all or a significant portion of its range.

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